HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

SITE INVESTIGATION REPORT
APPENDIX C
VOLUME II

4-87

PROJECT #495-1
APRIL 1987

EDER ASSOCIATES
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April 10, 1987
File #495-1

Mr. Craig Liska
Waste Enforcement Branch
RCRA Enforcement Section
Region V - 5HE-2 JCK
United States Environmental
Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Re: Hukill Chemical Corporation
Bedford, Ohio
EPA I.D. No. 001926740

Dear Mr. Liska:

We are pleased to submit our draft engineering report, "Site Investigation Report" for your review.

This report presents the results of site work conducted to: 1) determine the nature and extent of contamination from the solid waste management units; 2) determine the need for corrective actions; and 3) select and implement the Environmental Protection Agency approved corrective action.

We are available to discuss the report with you. Please contact our office if you have any questions.

Very truly yours,

EDER ASSOCIATES CONSULTING ENGINEERS, P.C.

Gary A. Rozmus, P.E.

GAR/tg
Enc.

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1.0 INTRODUCTION

Hukill Chemical Corporation (HCC) owns and operates a chemical distribution center and solvent recovery facility located in an industrial park at 7013 Krick Road, City of Bedford, Cuyahoga County, Ohio. HCC recycles spent industrial solvents using two thin film evaporators and a fractionating distillation tower. HCC has RCRA Interim Status as a generator and storage facility and has applied for a RCRA Part B Permit. A site plan is included in Appendix A (Drawing No. 1). A detailed description of the facility's operations is provided in the Part B Permit application. Site and regional topographic maps are also provided in the Part B application.

HCC entered into a Consent Agreement and Final Order (CAFO) with the United States Environmental Protection Agency (USEPA) to conduct an investigation: to determine the nature and extent of potential contamination due to storage operations at the facility solvent tank farm; to determine the need for corrective action to eliminate potential threats to the environment; and to select and implement the EPA approved cost effective corrective action. Pursuant to the terms of the CAFO, Eder Associates (EA) submitted an engineering report, "Plan for Determining the Extent of Potential Contamination", November 1985 to the USEPA and Ohio Environmental Protection Agency (OEPA). This report was modified by a letter to the USEPA dated January 16, 1986 and was approved by the USEPA and the OEPA in February 1986. The engineering report described a six part site investigation to be conducted at HCC:

Task 1: Background Information
Task 2: Site Investigation
Task 3: Report of Site Investigation
Task 4: Review of Alternative Corrective Actions
Task 5: Conceptual Design of Selected Alternative
Task 6: Corrective Action Study Report

The field work described in Task 2 of the November 1985 engineering report was conducted in April and May 1986. At that time, USEPA requested that HCC submit a formal plan to address the corrective action requirements of the 1984 Hazardous and Solid Waste Amendments (HSWA) that apply to facilities seeking RCRA permits.

EA submitted a draft engineering report, "Proposed Investigation for the Certification Regarding Potential Releases from Solid Waste Management Units" in July 1986. The final report was submitted in August 1986 and was modified by EA's September 1986 letter to the USEPA. The modified report was verbally approved by USEPA. The report describes the investigation to be conducted for each of the solid waste management units (SWMU) at the HCC facility to determine whether releases of hazardous waste constituents have occurred, the extent and concentrations of releases and appropriate corrective action.

The SWMU investigation was divided into the work tasks described in the November 1985 engineering report. Because the work described in the November 1985 and the August 1986 engineering reports overlapped, USEPA agreed to allow the work to be performed concurrently. The site work related to the SWMUS was conducted in September and October 1986.

The CAFO required that HCC close an underground cistern located at the facility. EA submitted to USEPA and OEPA an engineering report, "Closure Plan for Underground Cistern" which was approved by OEPA in October 1985. OEPA permitted HCC to conduct the work associated with closing the cistern concurrently with the work outlined in the November 1985 and August 1986 engineering reports. The closure work was conducted in April/May 1986 and September/October 1986.

In November 1985, HCC entered into a Findings and Orders (F&O) with the OEPA to determine the cause of exceedances of the facility

NPDES discharge permit and to develop and implement appropriate corrective measures.

Preliminary sampling and analysis of a set of indicator parameters indicated that the exceedances were caused by infiltration of the storm water piping at the site. The terms of the F&O permitted HCC to conduct site work associated with the investigation of storm water discharge problems and to identify and implement corrective measures to resolve discharge problems concurrently with the work related to the SWMUs, the solvent tank farm, and the underground cistern.

This submission summarizes and analyzes all work conducted pursuant to the following EA reports and the NPDES Findings and Orders:

1. "Plan for Determining the Extent of Potential Contamination";

2. "Closure Plan for Underground Cistern"; and

3. "Proposed Investigation for the Certification Regarding Potential Releases from Solid Waste Management Units".

2.0 DESCRIPTION OF SOLID WASTE MANAGEMENT UNITS

The following subsections describe the SWMUs and associated areas investigated at the HCC facility. The approximate locations of the units are shown in Drawing Nos. 1, 2 and 3 in Appendix A.

2.1 Solvent Tank Farm

Reclaimed and waste solvents are stored in aboveground, steel tanks in a bermed tank farm. The southern berm is masonry with earthen materials forming the remainder of the berm to a height of approximately four feet. The base of the tank farm is gravel.

There are two pipe galleys to the tank farm installed in the north-south directions. One pipe galley is installed at approximately grade elevation and penetrates the masonry berm in the southwest corner of the tank farm. The second pipe galley is routed over the four foot high masonry berm in the southeast corner of the tank farm.

The tank farm area is dewatered using a collection sump located in the northeast corner and a second sump located in the southwest corner of the tank farm. to where?

2.2 "Chem-Pack" Fill Area

With OEPA consent, a material known as "Chem-Pack" was used during the period 1970-1971 to grade areas north of the solvent tank farm. The "Chem-Pack" material was considered non-hazardous solid waste formed by the solidification of pickle liquor.

2.3 Northwest Fill Area

Construction debris and fill material were used to grade the northwest area of the HCC facility.

2.4 Underground Cistern

An underground, precast, concrete cistern was installed around 1975 east of the HCC facility buildings. Floor drains and collection trenches, located in the HCC processing building were interconnected to the cistern which served as a gravity fed secondary spill containment storage tank. Floor drains and trenches connected to the cistern were sealed in 1982. Drawing No. 2 shows the cistern piping in the process building.

2.5 Neutralization Pits

HCC used two limestone filled pits to neutralize spent acid waste. The pits were located below grade in an area north of the HCC buildings. The pits were used between approximately 1974 and 1976 at which time they were filled to grade and abandoned.

2.6 No Free Liquid Container Storage Area

This area is located to the east of the HCC facility building. It is used to store 55 gallon drums which do not contain free liquids. The storage area consists of a concrete pad surrounded on the south and eastern boundaries by a six inch high concrete curb.

2.7 API Tank Basin

An underground, 10,000 gallon API separator tank is located to the east of the solvent tank farm. A containment basin for storm water runoff is located above the API tank. The depth at the center of the basin is approximately 4 ft. The API tank presently serves two purposes. It is the collector for a french drain system, located to the east of the solvent tank farm (Drawing No. 3) installed to collect subsurface seepage that could migrate in an easterly direction from the tank farm. The API tank is also used to store storm water collected in a 1,500 gallon tank (Drawing No. 3) connected to the storm water collection system. The transfer of storm water to the API tank is performed during dry weather periods.

2.8 Storm Water Collection System

The HCC facility has a storm water sewer collection system which diverts storm water to Outfall No. 001 located east of the Hukill facility buildings at the tributary to Tinkers Creek. The discharge to the tributary is regulated by a State NPDES permit which limits have been exceeded from time to time. Drawing No. 3 shows the approximate layout of the storm water collection system.

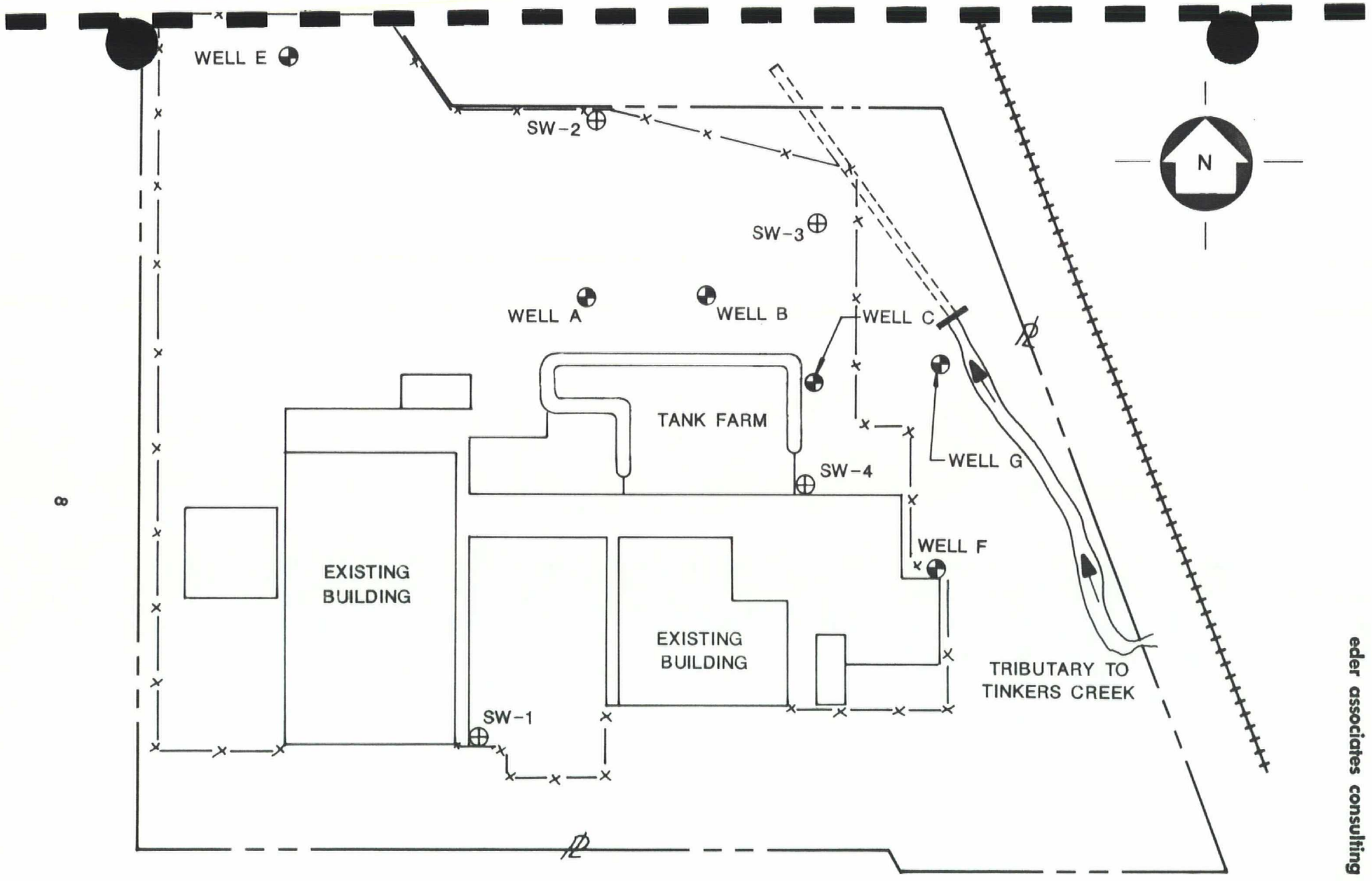
3.0 HYDROGEOLOGICAL CONDITIONS

Investigations conducted during April/May and September/October 1986 included test borings and monitor well installations to define soil, subsoil, shallow geologic and groundwater conditions at the HCC site. A total of 63 soil borings plus six monitor wells were installed during this period. Currently, there are a total of 10 monitor wells on site as shown on Figure 1. All monitor well and soil boring logs are presented in Appendix B. Four hydrogeological cross sections, designated as sections A-A', B-B', C-C' and D-D', are presented at the end of this section (Figures 4 through 8).

Most of the site is underlain by fill material ranging in thickness from one ft. to over 25 ft., and consisting of silty-sandy clay loam except in the "Chem-Pack" and Northwest fill areas where other types of fill are present as described in preceeding sections of this report. Underlying fill material is glacial till deposited during the Illinoian stage of glacial advancement. It is a silty clay till which varies in thickness at the site. In some areas, the fill material overlies the shale bedrock (Meadville Shale). Grain size analysis tests performed on samples of the fill, till, and shale by Triggs and Associates, Inc. are presented in Appendix A. B

A fractured and weathered zone characterizes the upper 25 ft. of shale. Numerous fractures are present which allow the circulation of shallow groundwater. Beneath this zone, the shale is more consolidated, less permeable, and is an aquiclude (not a water bearing unit).

A small gulley borders the northern and eastern edges of the site where the surface topography drops sharply into a small intermittent tributary of Deerlick Run, Tinkers Creek, the Cuyahoga River and, ultimately, Lake Erie. Unconsolidated glacial deposits pinch out in this gulley, which contains alluvial deposits consisting of



⊕ MONITORING WELL (INSTALLED IN 1986).

⊕ MONITORING WELL (INSTALLED IN 1982).

WELL LOCATIONS

SCALE 1" = 100'

eder associates consulting engineers, p.c.

FIGURE 1

interbedded silty clays, sandy clays and laminated silts with interbedded layers of organic clays and silts. These sediments lie directly on the shale bedrock which outcrops along the creek.

The shallow groundwater flow map presented on Figure 2 was pepared using water level elevations of October 1986. Vertical groundwater flow is shown schematically on Figure 3. Water level elevations are presented in Table 1.

The groundwater system has been identified at the site. Groundwater is confined in the weathered shale zone which is overlain by relatively impermeable silty clay fill and glacial till deposits and underlain by unweathered shale. Water levels in wells in the weathered shale stabilized an average of 10 ft. higher than the saturated zone tapped by the wells. The saturated weathered shale zone is underlain by gray shale which forms the lower confining layer.

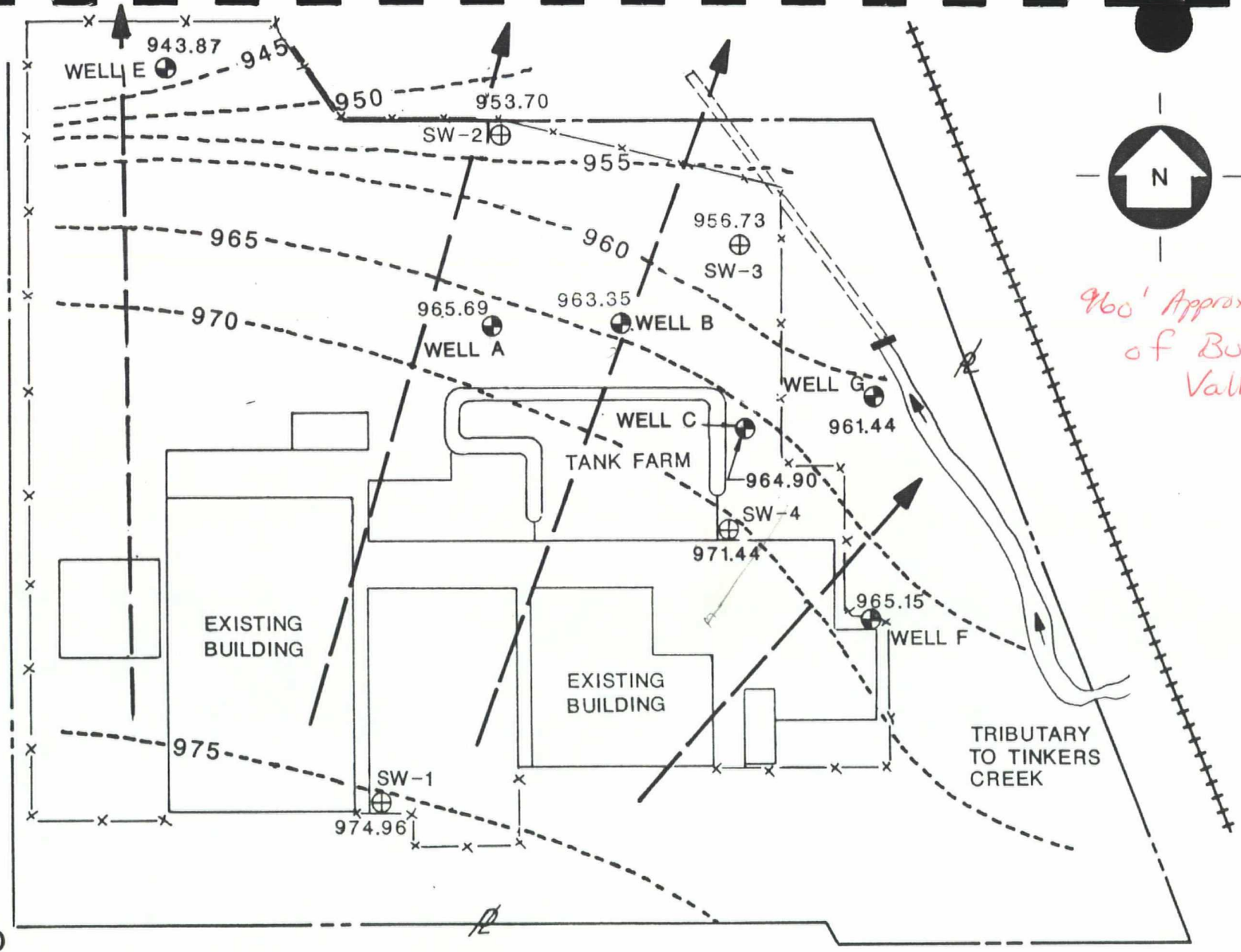
Perched Water Flow!

A deep well was planned for the evaluation of the potential for vertical migration of contaminants into the shale bedrock. The deep well was drilled to a depth of 44 ft. and casing was installed to 34 ft. and the bottom 10 ft. remained open. No groundwater was detected in the shale below the saturated fractured and weathered zone. The test well was left open to determine if any water would be produced, but, after one week, the test well remained dry. Based on this data, the shale underlying the site is relatively impermeable with little or no interconnection between fractures. Consequently, downward migration of shallow groundwater is prevented by the shale and it does not enter the underlying Berea or Sharpsville Sandstone aquifers.

#1D

The site investigation results indicate that the groundwater found in the weathered shale under the site is confined to a narrow zone near the till/shale interface. The flow pattern in this zone appears to be lateral into the creek which forms the northern and eastern boundaries of the property.

How does M.C. affect shale!



LEGEND

- MONITORING WELL (INSTALLED 1986)
- MONITORING WELL (INSTALLED 1982)

[ELEVATIONS IN FEET]

(OCTOBER 1986)

GROUNDWATER FLOW PATTERN

FIGURE 2

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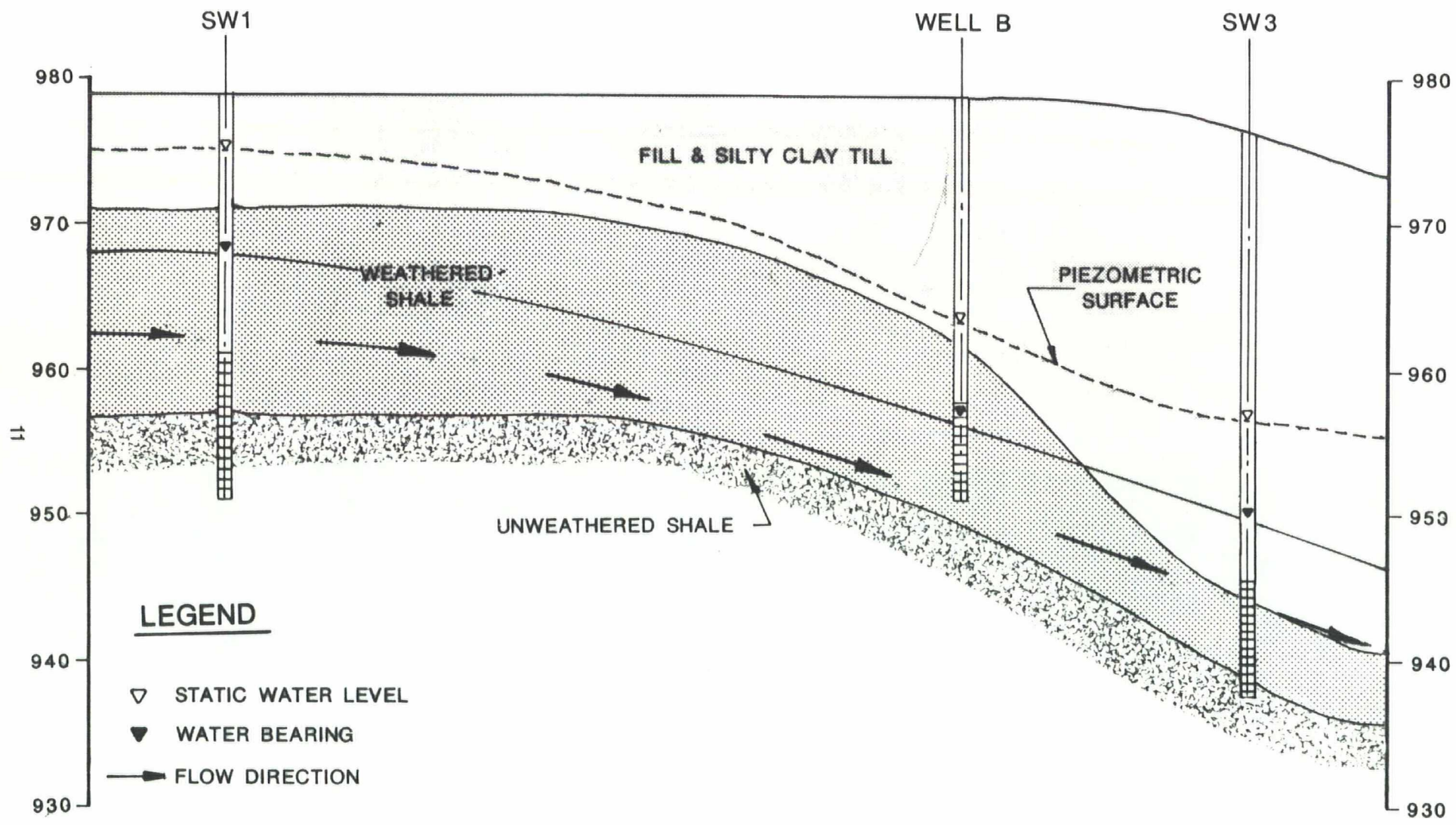

VERTICAL GROUNDWATER FLOW PATTERN

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FIGURE 3

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 1

WATER LEVEL ELEVATIONS (ft)

Monitor Well	Date					
	September 1982	October 1982	May 1986	September 1986	October 1986	February 1987
SW-1	974.65	975.09	974.06	974.96	--	(NA)
SW-2	952.76	953.00	952.85	--	953.70	953.85
SW-3	956.34	956.48	956.83	956.73	--	955.86
SW-4	969.23	970.86	972.29	971.79	--	971.21
A	(1)	(1)	967.24	965.69	--	966.17
B	(1)	(1)	964.55	963.35	--	963.72
C	(1)	(1)	966.60	964.90	--	965.77
E	(2)	--	--	--	943.87	944.22
F	(2)	--	--	--	965.15	969.12
G	(2)	--	--	--	961.44	961.07

Notes:

1. Wells A, B and C installed in April 1986
2. Wells E, F and G installed in September and October 1986
3. (NA) not accessible

As part of a groundwater quality assessment program at a neighboring site, Egbert Corporation (formerly S.K. Wellman Corporation), three deep and eight shallow wells were installed at depths ranging from 70 to 80 ft. and 10 to 30 ft. respectively. Egbert Corporation retained Woodward-Clyde Consultants to conduct a site investigation for closure of a surface impoundment constructed in 1956 as part of on-site industrial wastewater treatment. Wastewater treatment sludge (Hazardous Waste Code F006) was stored in the impoundment.

At least 43' Gray Shale

Results of Woodard-Clyde's site study entitled "Implementation of Egbert Corporation's Groundwater Quality Assessment Program" indicate that, although groundwater was found during air-rotary drilling at depths ranging from 62 to 72 ft., once the deep wells were bailed dry, they did not recover an appreciable amount of water for several months. This, plus the large difference in water elevations between the shallow and deep wells (29 ft.), indicates that the shale underlying both the Hukill and Egbert sites is impermeable and prevents local recharge of the underlying sandstone aquifers.

Groundwater flow at HCC is predominately to the north-northeast toward the alluvial deposits at the creek. Hydrologic gradients increase from 0.022 ft/ft in southern sections of the site to over 0.08 ft/ft in the northern section. Permeabilities of the confining soils have been measured and were found to be very low. Silty till deposits were found to have a permeability of 2.8 EE-5 cm/sec, while clayey till samples ranged from 2.2 EE-8 to 8.6 EE-8 cm/sec. A sample from the weathered shale zone was found to have a permeability of 2.4 EE-8 cm/sec. Although the absolute permeability of the weathered shale sediments was found to be quite low in the laboratory, this unit is quite permeable overall due to its high incidence of fractures (secondary permeability).

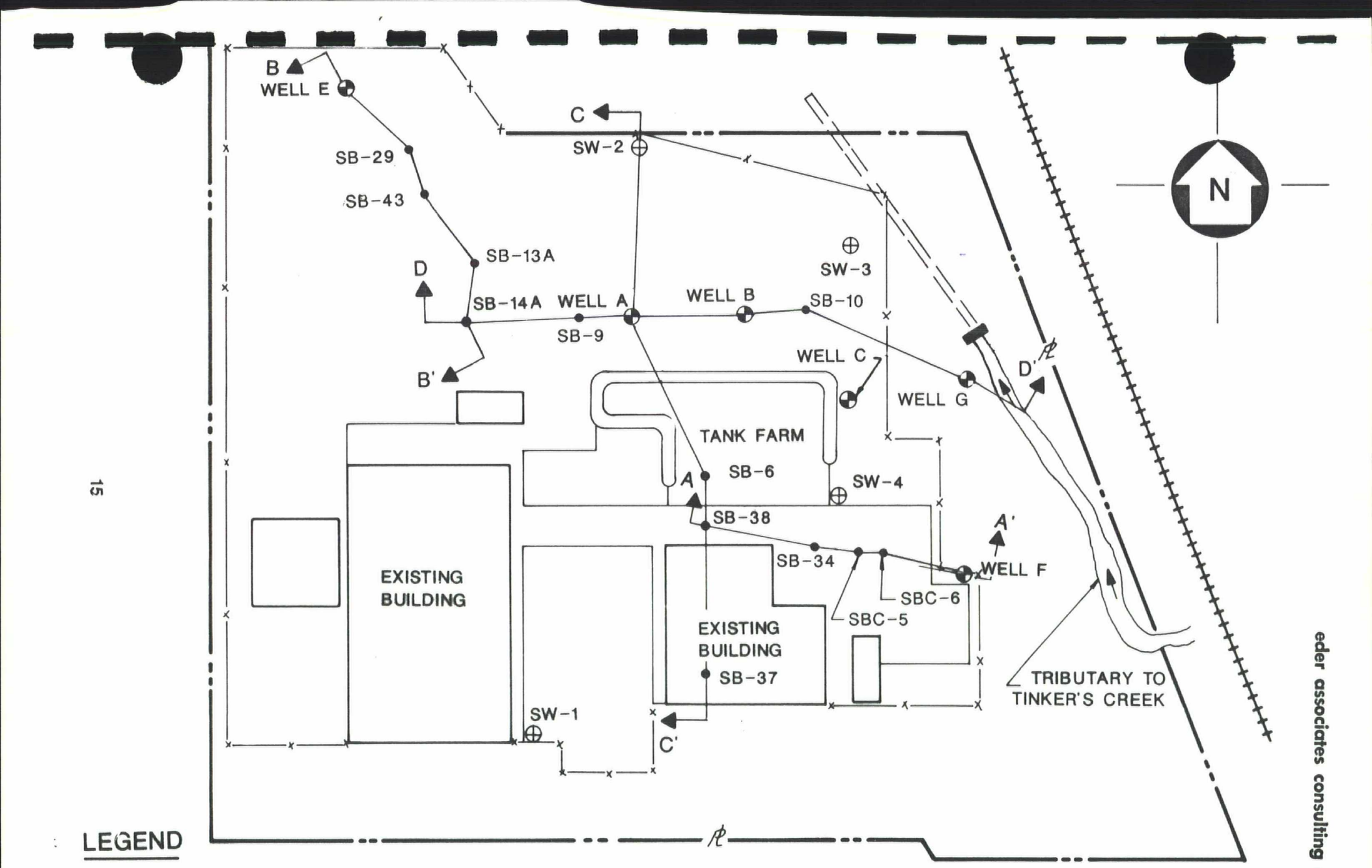
The hydraulic conductivity of Wells A and B were measured using the slug "falling head" test method. Slug testing involves either injecting from a well (falling head) or withdrawing (rising head) a

slug of water of known volume. The rate at which the water rises or falls is controlled by the formation characteristics. Based on the results of the tests, with calculations performed according to prescribed methods, the permeability at Well B was estimated to be 4.23 EE-04 cm/sec or 1.2 ft/day. A slug test was also attempted at Well A, however before any water level measurements could be made, the slug of water had already recharged into the formation. Slug tests are only practical for lower permeability materials. Permeability at Well A is assumed to be quite high, since fracturing in the shale is much more pronounced than in Well B. Several "dry holes" were drilled next to holes containing adequate wet seeps which verify the considerable variations in permeability throughout the shallow groundwater zone.

Multiple well tests!

Estimates of groundwater flow rate would be difficult to calculate accurately in the weathered shale zone. The material exhibits changes in hydrologic conductivity due to varying amounts of fracture in the shale. Groundwater flow at the site may be described as occurring between highly fractured zones and zones where there is less fracturing and open pore spaces. The permeability or hydraulic conductivity of this groundwater system is controlled by the number of cracks and fractures present. The groundwater follows these cracks and fractures downgradient to the creek. What is creek surface elevation

Drilling conducted at the plant process building, inside the tank farm, and around the cistern revealed a layer of perched groundwater. This water was found in the sandy fill material around underground piping under the east process building of the plant. Perched water was found above impermeable clay till deposits at 2 to 3 ft. below the concrete floor. Water also is present at the surface in the gravel base of the tank farm. It appears that the perched water in the tank farm is connected to the perched water found under the building by sand backfilling around underground plant piping and beneath facility structures (i.e., footings and foundations).



LEGEND

- ◓ MONITORING WELL (INSTALLED 1986)
- ⊕ MONITORING WELL (INSTALLED 1982)
- • SOIL BORING (SB)

SCALE 1"= 100'

LOCATION OF CROSS SECTIONS

FIGURE 4

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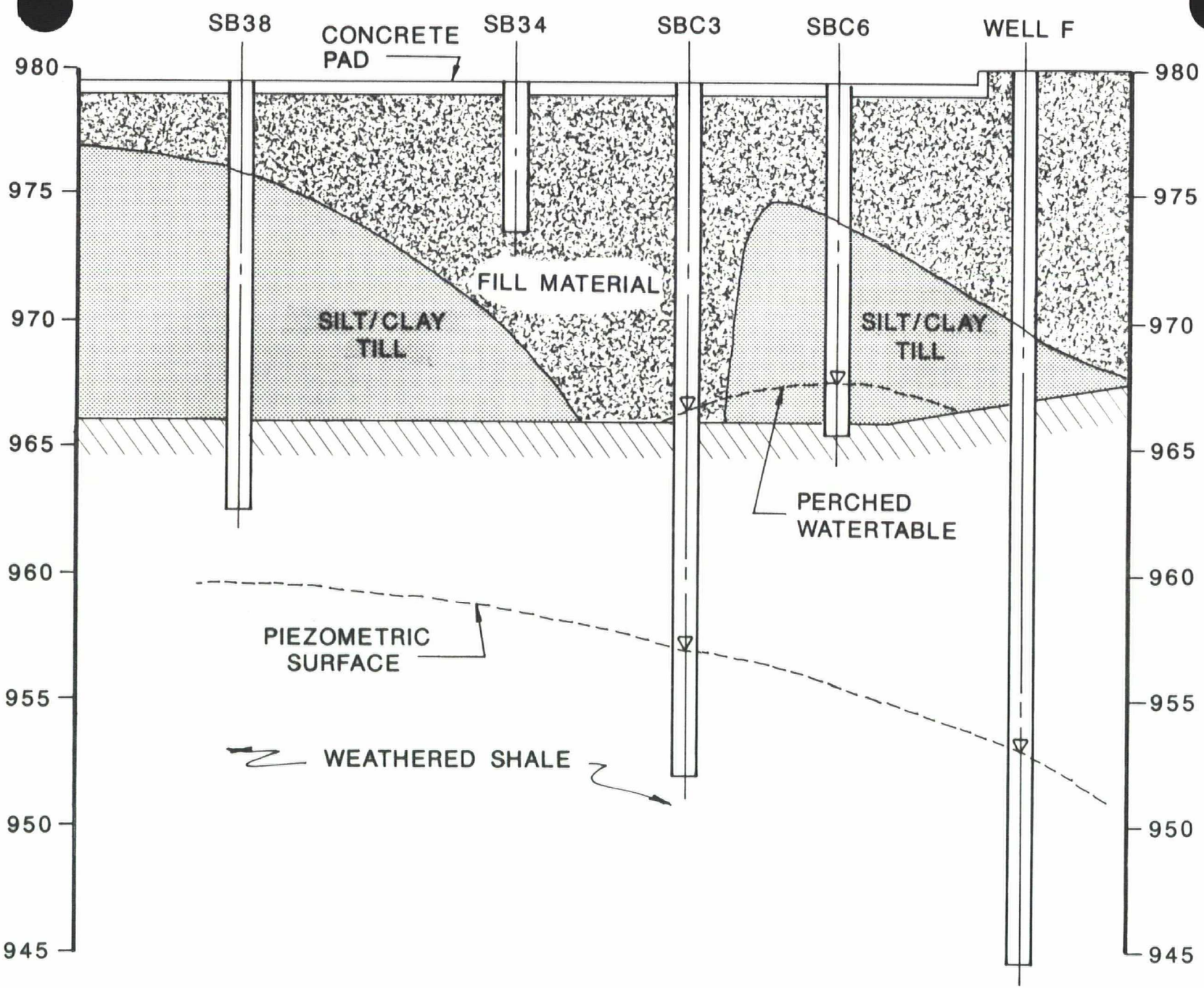
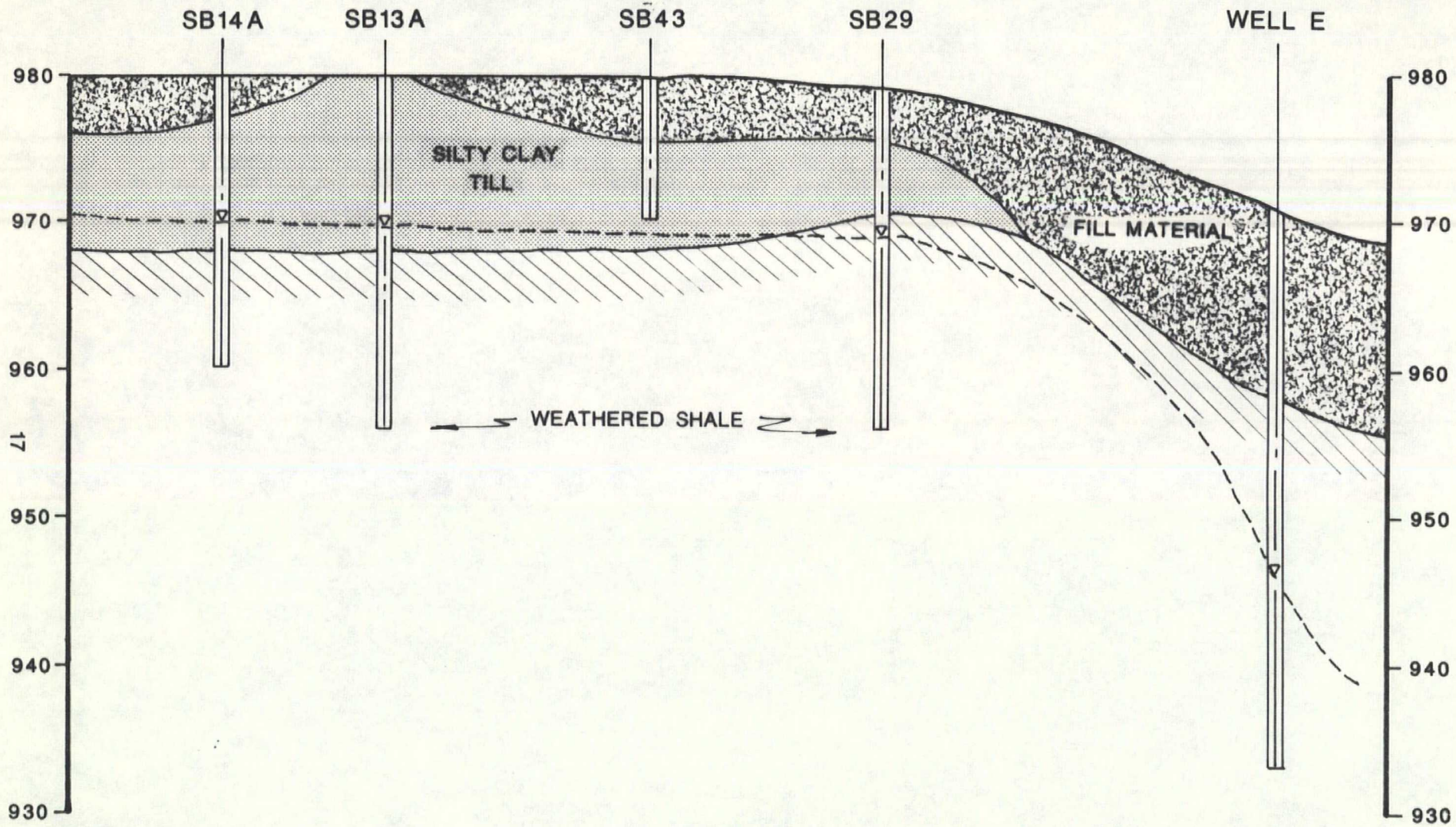


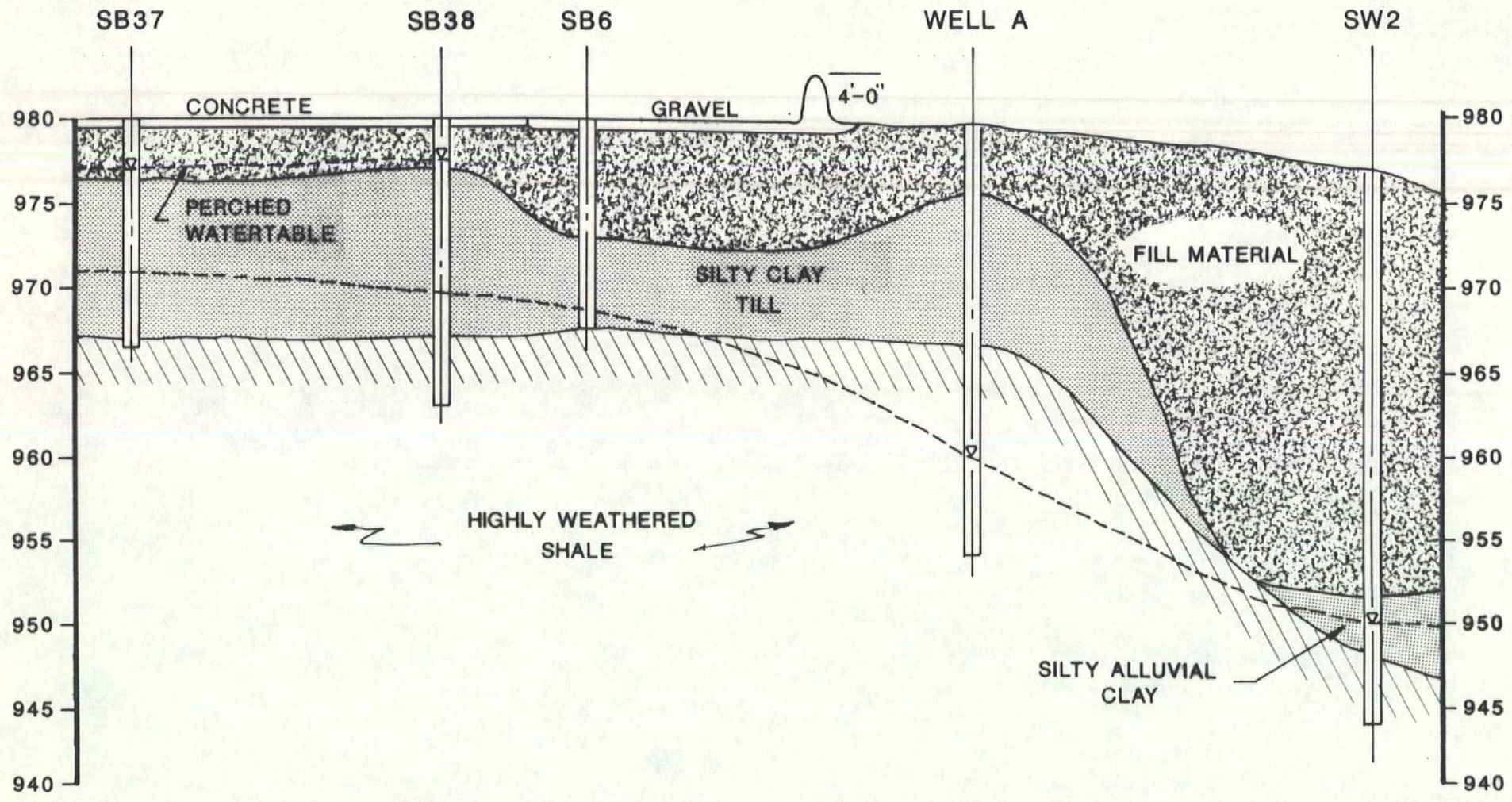
CROSS SECTION A-A

FIGURE 5

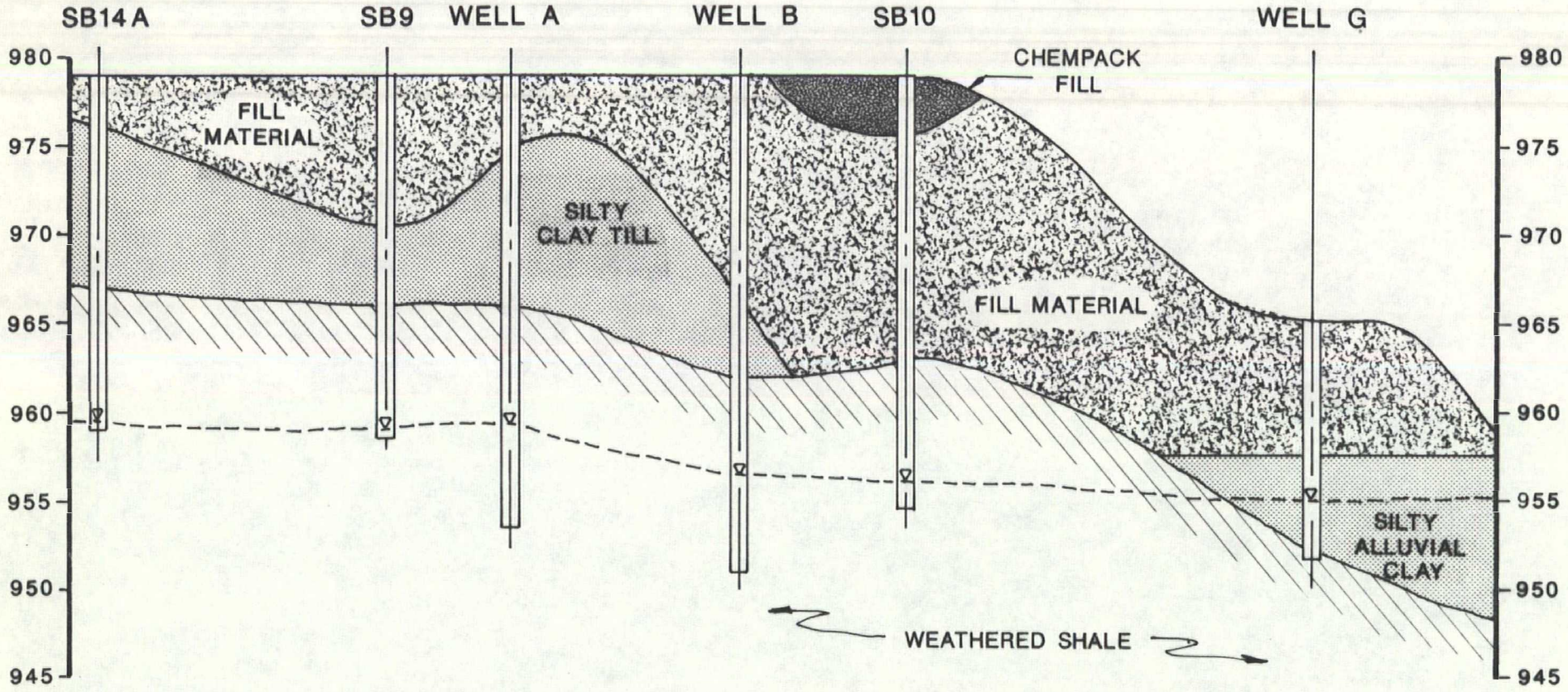


CROSS SECTION B-B

FIGURE 6



CROSS SECTION C-C



CROSS SECTION D-D

4.0 WELL INSTALLATIONS

Monitor wells were installed in accord with the protocols described in the Quality Assurance and Program Plan of the November 1985 engineering report downgradient of each area of concern. Prior to the current site investigation, four monitor wells SW-1, SW-2, SW-3, and SW-4 were installed under the direction of the NUS Corporation. During 1986, six additional monitor wells, Wells A, B, C, E, F and G were installed by Triggs & Associates, Inc., Willoughby Hills, Ohio under EA's direction.

A 6-1/4 in. I.D., hollow stem auger was used to drill the boreholes and soil samples were taken at 3 ft. intervals with a 1-3/8 in. I.D. split spoon sampler. Blow counts were recorded to aid in identification of soil/strata changes.

Drilling and sampling continued to 5 ft. below the water table at which point the augers were removed from the borehole. It was possible to pull the augers out of the boreholes without cave-ins or collapses. A 2 in. diameter, stainless steel, well casing with 5 ft. of ten slot (0.01) screen was set to bridge 1 ft. above and 4 ft. below the water table. The annular space surrounding the screens was filled with clean, well sorted sand to 1 ft. above the screen. Bentonite seals were installed using a tremie pipe to 2 ft. below grade. Two ft. deep concrete caps were installed at grade. A locking cap was installed on each well.

As-built construction diagrams for each monitor well are shown in Appendix ~~A~~ B. Locations of all monitor wells are shown on Figure 1.

The following is a description of each well installed under EA's direction.

Monitor Well A: This well is located downgradient of the west end of the tank farm and monitors groundwater flowing from that area. Continuous split spoon sampling was performed to 4.5 ft., then at 3 ft. intervals. Fill material was encountered to 4 ft. Silt and clay dominated the matrix with little sand and gravel. Glacial till material was found to a depth of 13 ft. Fractured/weathered very fissile and weak gray shale occurred throughout the remainder of the boring. Water was encountered at 19.5 ft. and rose to 12 ft. 24 hours after the boring was completed. The monitor well screen was set from 18.5 ft. to 23.5 ft. The total depth of the boring is 25.5 ft.

Monitor Well B: This well is located east of Well A and monitors groundwater flow through central sections of the tank farm. Fill material contained wood, glass and rubber fragments along with the silt, sand and clay to 12.5 ft below grade. Glacial till extended down to 17 ft., water was encountered at 22.5 ft. from grade in the fractured/weathered shale and rose to 17 ft. upon well completion. The screen was placed between 21.5 ft. and 26.5 ft. below grade. The boring depth is 28 ft.

Monitor Well C: This well is located at the northeast end of the tank farm to intercept groundwater flow through the east end of the tank farm. Gravel, cobbles and sand were found in the upper 5 ft. of the boring. This was underlain by 8 ft. of glacial till. Gray fractured/weathered shale was found at 13 ft. with water occurring 5.5 ft. below the till/shale interface at 18.5 ft. Water rose to 16 ft. upon well completion. The screen was set at 17.5 to 22.5 ft. and the borehole depth is 24 ft.

Proposed Monitor Well D (deep well): The boring for Well D is located adjacent to Monitor Well C, which has shown the highest concentration of volatile organic chemicals. Well D would monitor the vertical movement of groundwater in the aquifer. A 6-1/4 in. hollow stem auger was used to 14 ft. (top of the fractured/weathered shale). Rotary drilling with clean water was used to penetrate the

consolidated shale under the weathered/fractured zone. A 4 in. diameter steel casing was set at 34 ft. with an open hole to 44 ft. The well was bailed dry upon installation and it remained dry over an entire week, at which time it was decided not to install the well. The casing was removed and the borehole was abandoned by filling with cement/bentonite to land surface.

Monitor Well E: This well is located downgradient of the "northwest landfill area" to intercept groundwater moving through this area. During the drilling, sand, brick, glass and foundry slag were encountered to 13 ft. with fractured/weathered gray shale encountered throughout the remainder of the boring. Water was encountered at 32.5 ft. and the screen was set between 32.5 ft. and 37.5 ft. The boring extended to 38.5 ft. Water rose to 28.1 ft. upon well completion.

Monitor Well F: The original location of this well was changed when groundwater was not encountered at 35.5 ft. A new location was chosen 30 ft. to the south of the planned location and groundwater was encountered in the fractured/weathered shale at 24.5 ft. The screen was set between 24 ft. and 29 ft. Water rose to 15.8 ft. upon well completion. This well monitors groundwater flowing downgradient from the container storage area and underground cistern. No!

Monitor Well G: This well was installed next to the creek downgradient of the tank farm. Well G was placed to monitor groundwater flow downgradient of the tank at the creek. The well was installed based on first quarter groundwater monitoring data. Water was encountered at 9.5 ft. in gray to black alluvial silt and clay and rose to 6.8 ft. upon boring completion. The screen was set from 7 ft. to 12 ft. below grade. The boring extended down to the fractured/weathered shale at 13.5 ft. Well G was installed in addition to the wells described in the November 1985 and August 1985 engineering reports. The location and installation of Well G was reviewed with the USEPA during the September site work.

Problems @ C?

More for Line with Cistern Culvert? Precludes other locations?

Craig ↑

5.0 SOIL SAMPLING

Surface and subsurface soil samples were collected in selected areas to define the nature and extent of possible contamination. Drawing No. 1 shows the location of each soil boring/sampling point. All soil sampling procedures were performed in accord with the "Quality Assurance Program Plan" (QAPP) described in EA's, "Plan for Determining the Extent of Potential Contamination", November 1985.

5.1 Background Soil Borings

Four background soil borings, SB-13, SB-14, SB-15, and SB-16, were drilled and sampled to establish a reference background to which the other soil samples could be compared. Soil samples from each of these borings were collected at 1.5 ft. intervals from the surface to 4.5 ft. and at 3.0 ft. intervals below 4.5 ft. The background sample for organic analysis was composited from the four background borings. Individual samples for metals analyses were taken from each elevation in each soil boring. The total organic concentration was measured using a portable organic vapor analyzer (OVA) for a composite of soil samples from each background soil boring.

Organic readings above background were found during drilling/sampling of background boring SB-14. As soil samples from SB-13 were composited with samples from SB-14, the entire composite was considered contaminated and it was necessary to re-drill and resample SB-13 and SB-14 in different locations, SB-13A and SB-14A. These borings were drilled to the water table. Borings SB-15 and SB-16 were drilled to shale bedrock (25 ft. and 40 ft.) and groundwater was not encountered in either boring. The OVA readings were 5.0 ppm, 5.0 ppm, 75.0 ppm and 12.0 ppm for borings SB-13A, SB-14A, SB-15 and SB-16 respectively. These readings served as a reference background and soil samples with OVA readings greater than the lowest reference concentration of 5 ppm were considered contaminated.

SB 15 @ 22.5'

5.2 Solvent Tank Farm

Fourteen soil borings were drilled in and around the tank farm area. Five borings were drilled inside the tank farm and nine borings around the perimeter of the area. Sampling locations are shown in Figure 9 and Drawing No. 1. Proposed soil borings SB-2 and SB-5 were not drilled, because the equipment could not be set up and operated in a safe manner.

Samples were collected using an 18 inch split spoon sampler. Samples were taken continuously to 4.5 ft., and at 3 ft. intervals thereafter. Sampling continued to the depth of fractured/weathered shale in all borings (12 ft. to 13 ft.). SB-1, SB-9, SB-10, SB-11, SB-12, SB-17 and SB-18 were drilled to the water table.

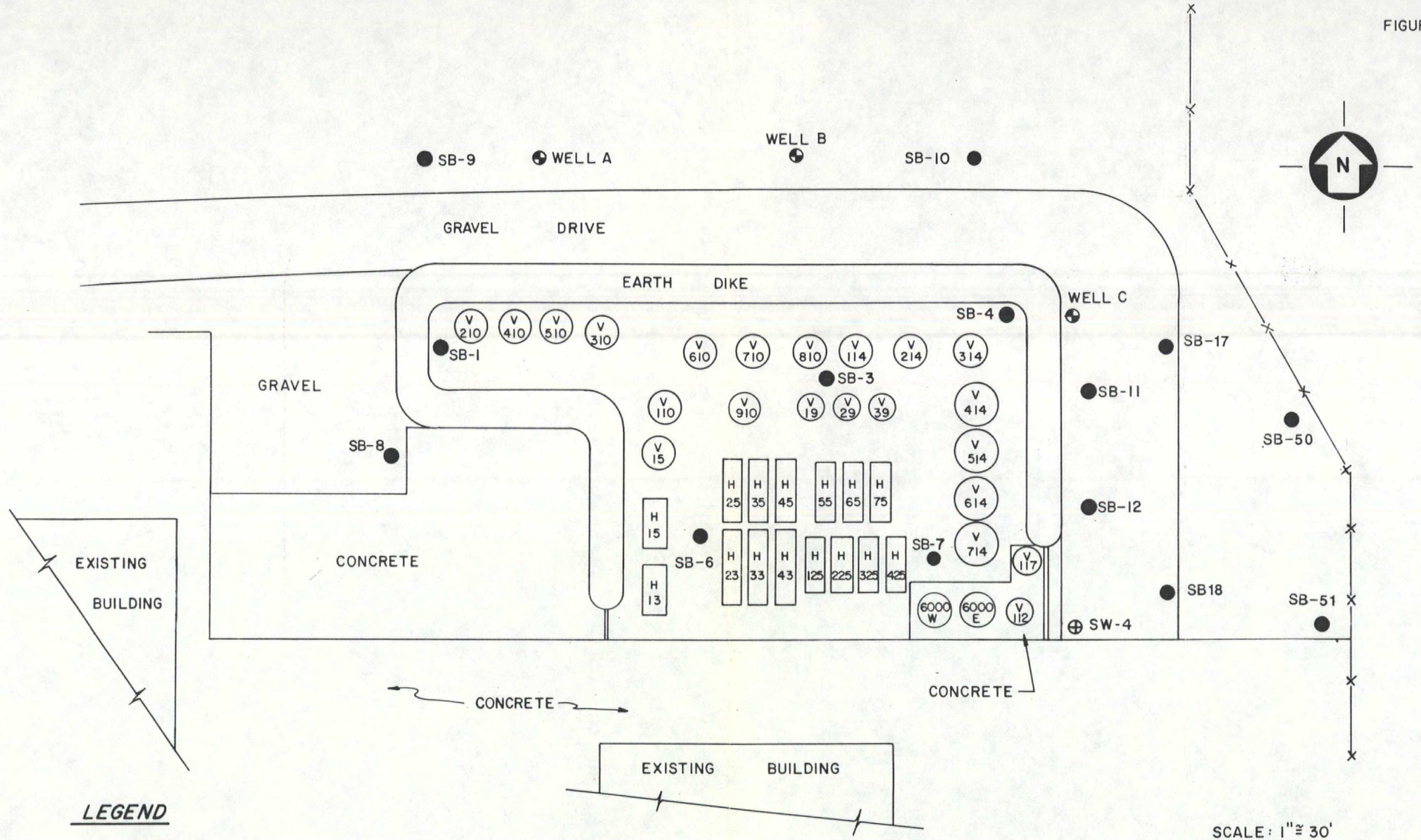
Each sample headspace was screened for total organic vapor content using prescribed OVA screening techniques and samples were selected for laboratory analysis based on these readings. In general, two samples at each boring were taken for analysis; the sample with the highest reading found in the upper unconsolidated deposits and the sample with the lowest reading found in or near the fractured/weathered shale.

5.3 "Chem-Pack" Fill Area

Five soil borings were drilled in this area to determine the vertical and areal extent of the "Chem-Pack" fill. These borings were located from a visual inspection of the area. Boring locations are shown on Drawing 1.

At each location, continuous split spoon sampling throughout the vertical extent of the "Chem-Pack" material was completed without augering. On average, the material extended to a 6 ft. depth, with the deepest fill found in SB-21 (15 ft.). Color variations of the "Chem-Pack" were noted with depth. At the surface and through the

FIGURE Nº 9



LEGEND

- ● SOIL BORING LOCATION
- ◓ MONITORING WELL (INSTALLED 1986)
- ⊕ MONITORING WELL (INSTALLED 1982)

NOTE:
STORAGE TANKS SHOWN IN APPROX. LOCATION.

SCALE: 1" ≅ 30'

SOIL SAMPLES & WELL LOCATIONS IN & AROUND TANK FARM

HUKILL CHEMICAL CORP.

BEDFORD, OHIO

Iron!

first few feet the "Chem Pack" has a rusty, orange-red color. Below the first few feet the material changed to green, white and gray.

In addition to "Chem-Pack" material, soil samples from borings SB-19 and SB-26, contained some black sand (possibly foundry sand). Samples collected from boring SB-25 contained black sand. No "Chem-Pack" was encountered in SB-25. This sand is located on the western edge of the "Chem-Pack" fill area. No black sand fill was found in samples from borings SB-10, SB-20, or SB-21.

Samples of "Chem-Pack" fill material were composited for laboratory analysis. One sample of soil was taken from 1.5 to 3.0 ft. below the fill material in SB-21 to determine if leaching has occurred from the "Chem-Pack" material. A sample of the black "foundry sand" was also sent to the laboratory for analysis.

5.4 Northwest Landfill Area

Six soil borings were drilled and sampled to the depth of split spoon refusal or to groundwater in the northwest corner of the HCC property where construction debris and fill may have been used for site grading. Split spoon samples were taken continuously to 5 ft. and then at 3 ft. intervals. Soil borings are located on Drawing No. 1.

The fill material consisted of glass, brick and gravel along with wood and ash. These materials dominated the upper 2 to 3 ft. of the fill. Foundry sand and slag material were found from the surface down to 23.5 ft. The fill ranged in thickness from 4.5 ft. in SB-29 to 27 ft. in SB-31. Cross section B-B in Section 3.0 of this report shows a southeast - northwest traverse across the area.

One composite sample consisting of samples from soil borings SB-28, SB-29 and SB-30 and one composite consisting of samples from soil boring SB-31, SB-32 and SB-33 were sent to the laboratory for organic and metals analysis. Samples which were anomalous to the fill were

collected and submitted to the laboratory for individual analysis. The anomalous samples showed higher OVA readings than the other fill samples.

5.5 Underground Cistern

Soil samples were collected from borings around the cistern made in accord with EA's engineering report, "Closure Plan for Underground Cistern". A total of six soil borings were drilled. Soil borings SBC-1, SBC-2, SBC-3 and SBC-4 were drilled around the walls of the tank. Soil borings SBC-5 and SBC-6 were drilled downgradient of the cistern towards the tributary to Tinkers Creek. Locations of the borings are shown on Drawing No. 1.

A 6-1/4 in. hollow stem auger was used to core through the 6.0 in. of concrete found at grade in the area of the cistern. Continuous split spoon samples were obtained through the augers to 6.5 ft and other samples were collected at 3.0 ft. intervals below 6.5 ft. Split spoon refusal occurred at 13 ft. at the top of the weathered/fractured shale bedrock. The cistern is surrounded by approximately 5 ft. of fill composed of sand, silt and gravel which extends to the shale bedrock. The bottom of the cistern rests on the shale bedrock. Soil borings SBC-5 and SBC-6 encountered fill material to a depth of 5.5 to 6.0 ft. below grade. Below this fill is a silty, sandy till which lies above the weathered/fractured shale bedrock found at a depth of 13 ft. Perched water was found above the shale bedrock at 12 to 13 ft. below grade in samples from borings SBC-3 and SBC-6.

Several soil borings were completed inside the plant building and in the aisle between the tank farm and the building. SB-36, SB-36A and SB-37 were drilled inside the building. Borings SB-34 and SB-38 were drilled in the center of the aisle between the tank farm and the plant process building. Boring SB-35 was drilled to the south of the cistern. Specific locations for the borings are shown on Drawing No. 1.

Sandy fill material was found surrounding the underground piping beneath the facility. The fill extended an average depth of 3.5 ft and rested on the clay till. Borings SB-37 and SB-38 where drilled into shale bedrock which occurred at 13 ft. Perched water was found on top of the impermeable clay till deposits in borings SB-36, SB-36A, SB-37 and SB-38 at 2 to 3 ft. below the concrete floor. Perched water accumulated in borings SB-36, SB-36A and SB-37 and was collected and submitted to the laboratory for organic analysis. Accumulation of perched water did not occur at boring SB-38 and therefore no liquid sample could be collected for analysis.

5.6 Neutralization Pits

It was originally planned to locate the two neutralization pits by boring on a grid pattern. However, a visual inspection found two rectangular areas with sparse vegetation. Plant personnel and subsequent soil sampling confirmed that these areas were in the immediate vicinity of the former neutralization pits.

Two soil borings were drilled in each neutralization pit; SB-39 and SB-40 in the west neutralization pit and SB-41 and SB-42 in the east neutralization pit. Locations of the soil borings are shown on Drawing No. 1. A continuous split spoon sample was taken from 4.5 to 7 ft. below the bottom of each pit (refer to boring logs in Appendix A.) Samples were collected for analysis at the surface (0 to 3.0 ft.); at the bottom of the pit (4.5 to 6.0 ft.); and from below the pit at (9.5 to 11.0 ft.).

5.7 API Tank Basin/No Free Liquid Container Storage Area

Two soil borings were drilled to the east of the API tank basin (SB-50 and SB-51). Four soil borings were drilled and one well was installed around the perimeter of the container storage area (SB-46, SB-47, SB-48, SB-49 and Well F). Soil samples were collected from each boring including the Well F borehole. Locations of each soil boring and Well F are shown on Drawing No. 1.

Continuous samples were collected with a split spoon sampler to 5.0 ft. Subsequent samples were taken at 3.0 ft. intervals. All samples were screened with the OVA.

Borings around the API tank basin showed sand and gravel fill material ranging in depth from 2.0 to 8.0 ft. below grade. Clay till underlies the fill material and rests on top of the fractured/weathered shale. Groundwater was found in the weathered shale from 20 to 27 ft. below grade. Borings around the container storage area show a similar subsurface profile. Drilling extended to a depth where background OVA readings were reached.

Well F was not installed in its originally proposed location because drilling continued to 35.5 ft. without encountering a saturated zone. It was determined that there was no groundwater flow at this location and Well F was relocated and installed in soil boring SB-46 where groundwater was encountered at 24.5 ft.

6.0 RESULTS OF INVESTIGATION

This section provides a unit by unit summary of the results of the sampling conducted at the various waste management units at the HCC facility. Laboratory reports are provided in Appendix C in the same order as the results are presented in this section.

6.1 Sample Analyses

Soil samples were submitted for analyses in accord with EA's November 1985 and August 1986 engineering reports. A summary of the chemical analytes is provided in Tables 2 and 3. Detection limits for the parameters are not shown in the tables because the limits will vary on a sample by sample basis in accord with the concentration ranges of the parameters present. Specific detection limits for a given sample are included Appendix C.

Sampling and analysis was performed in accordance with the Quality Assurance Program Plan (QAPP) described in the November 1985 engineering report. Organic analyses of samples were performed by NUS Corporation, Laboratory Services Division, Pittsburgh, Pennsylvania. Analyses of inorganic parameters were conducted by Wilson Laboratories, Salina, Kansas. Both are USEPA contract laboratories.

Laboratory Quality Assurance/Quality Control (QA/QC) was performed in accord with the USEPA's Contract Laboratory Program (CLP) protocol which includes blank, duplicate and spike samples. Field QA/QC protocols included field blanks and duplicates on 10 percent of each sample matrix. Laboratory QA/QC analytical results are provided in Appendix C. A summary of the organics detected in the method blanks and their concentration ranges is provided in Tables 4 and 5. The method blank organic results are divided into low level and medium level concentrations. Method blank results for metals are summarized in Table 6.

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TABLE 2

SUMMARY OF ORGANIC ANALYTES[1]

Chloromethane
Bromomethane
Vinyl Chloride
Chloroethane
Methylene Chloride (Dichloromethane)
Acetone
Carbon Disulfide
1,1-Dichloroethylene
1,1-Dichloroethane
Trans-1,2-Dichloroethylene
Chloroform
1,2-Dichloroethane
2-Butanone (Methyl Ethyl Ketone)
1,1,1-Trichloroethane
Carbon Tetrachloride
Vinyl Acetate
Bromodichloromethane
1,2-Dichloropropane
Trans-1,3-Dichloropropylene
Trichloroethylene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
cis-1,3-Dichloropropylene
2-Chloroethylvinylether

Table 2 Continued . . .

Bromoform
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)
2-Hexanone (Methyl Butyl Ketone)
Tetrachloroethylene
1,1,2,2-Tetrachloroethane
Toluene
Chlorobenzene
Ethylbenzene
Styrene
Total Xylenes
Ethanol
Isopropyl Alcohol
Isobutanol
Isopropyl Ether (2-2' oxybispropane)
Butyl Acetate
Ethyl Acetate
Aliphatic Hydrocarbons

Methanol?

NOTES:

1. These analytes are the volatile organic compounds listed on the USEPA's Hazardous Substance List (HSL) or that are identified by a spectra library search. Compounds were analyzed by GC/MS using a purge and trap technique. This list does not include all volatile organic compounds detectable via the spectra library search. Where compounds were detected via the library search, their concentrations are provided in the results of this report.

2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

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TABLE 3

SUMMARY OF METAL ANALYTES

Arsenic
Barium
Cadmium
Chromium (T)
Copper(1)
Iron(1)
Lead
Mercury
Nickel(1)
Selenium
Silver

NOTES:

1. These metals were run on neutralization pit and Chem-Pack samples.

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TABLE 4

SUMMARY OF METHOD BLANK RESULTS
LOW LEVEL ORGANIC ANALYSES

Parameter	Matrix	
	Water (ug/l)	Soil (ug/kg)
Methylene Chloride	2-9	4-19
Acetone	2-28	3-29
2-Butanone	15	2-6
1,1,1-Trichloroethane	LD	2-3
Toluene	LD	1-2
1,1,2-Trichloro -1,2,2-Trifluoroethane	20	8-20
4-Methyl-2-Pentanone	6	2-6
Trimethylsilanol	LD	2-10
2-Hexanone	9	LD

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the sample specific detection limits.

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TABLE 5

SUMMARY OF METHOD BLANK RESULTS
MEDIUM LEVEL ORGANIC ANALYSES

Parameter	Soil Matrix (ug/kg)
Methylene Chloride	790-1800
Acetone	1100-4400
2-Butanone	2500-4900
1,1,2-Trichloro -1,2,2-Trifluoroethane	2000

NOTES:

1. There were no medium level organic analyses of water samples.

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TABLE 6

SUMMARY OF METHOD BLANK RESULTS
METALS ANALYSES

Parameter	Concentration
Arsenic	LD
Barium	LD
Cadmium	LD
Chromium	LD
Copper	LD
Iron	LD
Lead	LD
Manganese(2)	LD
Mercury	LD
Nickel	LD
Selenium	LD
Silver	LD
Zinc(2)	LD

NOTES:

1. LD indicates less than the detection limit. Refer to the laboratory reports in Appendix C for the specific sample detection limit.

2. These parameters were analyzed on select samples in addition to those required by the Site Investigation engineering reports.

As part of the field QA/QC, a sample of the final rinse water used to decontaminate equipment was collected. The results of analyses are presented in Tables 7 and 8.

Field blank and duplicate analyses are presented with the sampling results in the following subsections.

6.2 Background Soil Samples

Samples collected from the four background soil borings (SB-13A, SB-14A, SB-15 and SB-16) were composited into one sample for organics analysis. The results of the organic analyses are shown in Table 9. Trace quantities of organics were detected in a background sample. However, five of the seven organic chemicals detected were also detected in laboratory's blank samples. Methylene chloride and acetone are known common laboratory contaminants. The remainder of the organic chemicals were detected at or near the detection limit required by the contract laboratory program (Contract Required Detection Limit, CRDL).

The background soil samples analyzed for metals were collected at the following depths in each boring and submitted for individual analyses:

0 to 1.5 ft.
7.5 to 9 ft.
12 to 13.5 ft.

These sampling depths were selected to coincide with the sampling depths around the cistern in order to obtain the data needed to perform the Student's "t" test of metals concentrations in the soil around the cistern and in background samples as required by OEPA. The results of the background metals analyses are provided in Tables 10, 11 and 12.

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TABLE 7

FINAL RINSEWATER
ORGANIC ANALYSES

Parameter	Concentration (mg/l)
Methylene Chloride	0.001 (J)
Chloroform	0.027
Bromodichloromethane	0.008
TOC	2.7
TOX	LD

NOTES:

1. J indicates compound identified at a concentration estimated below the detection limit.

2. LD indicates less than the detection limit. Detection limits are sample specific due to the concentration ranges of organics in samples. For the detection limit of a specific compound refer to the laboratory results in Appendix C.

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TABLE 8

FINAL RINSEWATER
METALS ANALYSES

Parameter	Concentration (mg/l)
Arsenic	LD
Barium	LD
Cadmium	LD
Chromium (T)	LD
Lead (R)	LD
Mercury	LD
Selenium (R)	LD
Silver (R)	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to the concentration ranges of organics in samples. For the detection limit of a specific compound refer to the laboratory results in Appendix C.

2. (R) indicates spike sample recovery was not within control limits.

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TABLE 9

BACKGROUND SOIL SAMPLE
ORGANIC ANALYSES

Sample Location	See Note 1
Sample Number	SS-1
Sample Depth	See Note 1
Parameter (ug/kg)	
Methylene Chloride	10 B
Acetone	48 B
2-Butanone	8 (J) B
1,1,1 Trichloroethane	6 B
4-Methyl-2-Pentanone	7 B
Toluene	6
Xylene	5 (J)
Total VOCs	90

NOTES:

1. Sample No. SS-1 is a composite of samples collected from soil borings SB-13A, SB-14A, SB-15 and SB-16 at intervals between the following depths:

   SB-13A - - - - - - - - 0-24.5 ft.
   SB-14A - - - - - - - - 0-20 ft.
   SB-15 - - - - - - - - 0-39.7 ft.
   SB-16 - - - - - - - - 0-19.5 ft.

2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

3. (J) indicates compound identified at a concentration estimated below the detection limit.

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TABLE 10

BACKGROUND SOIL BORING SAMPLES
METALS ANALYSES

Sample Location	SB-13A	SB-13A	SB-13A	SB-14A	SB-14A	SB-14A	SB-15	SB-16
Sample Number	SSM-29	SSM-29D	SSM-29B	SSM-37	SSM-37D	SSM-37B	SSM-16	SSM-44
Sample Depth (ft)	0-1.5	0-1.5	--	0-1.5	0-1.5	--	0-1.5	0-1.5
Parameter (mg/kg)								
Arsenic	13.0	17.0	LD	17.0	21.0	LD	19.0	8.2
Barium	91.0	183.0	LD	105.0	86.0	LD	107	159.0
Cadmium	3.6	4.3	LD	5.8	5.2	LD	LD	LD
Chromium	22.0	17.0	LD	LD	LD	LD	22.0	26.0 (R)
Lead	132.0	145.0	LD	103 (R)	104 (R)	LD (R)	85.0	116.0 (*)
Mercury	LD	LD	LD	LD	LD	LD	LD	LD
Selenium	LD	LD	LD	LD	LD	LD	LD	LD
Silver	LD	LD	LD	LD	LD (R)	LD (R)	LD	LD

+ Ba, Pb in surface.

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
2. (R) indicates spike sample recovery was not within control limits.
3. (*) indicates duplicate analysis was not within control limits.
4. (D) indicates duplicate analysis.
5. (B) indicates blank analysis.

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TABLE 11

BACKGROUND SOIL BORING SAMPLES
METALS ANALYSES

Sample Location	SB-13A	SB-14A	SB-15	SB-16
Sample Number	SSM-32	SSM-40	SSM-19	SSM-47
Sample Depth (ft)	7.5-9.0	7.5-9.0	7.5-9.0	7.5-9.0
Parameter (mg/kg)				
Arsenic	15.0	17.0	13.0	LD
Barium	LD	40.0	46.0	LD
Cadmium	4.0	4.0	LD	4.6
Chromium	19.0	14.0	18.0	18 (R)
Lead	10.0	17.0 (R)(S)	18.0	18 (*)
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	LD	LD (R)	LD	LD

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
2. (S) indicates concentration determined by the method of standard addition.
3. (*) indicates duplicate analysis was not within control limits.

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TABLE 12

BACKGROUND SOIL BORING SAMPLES
METALS ANALYSES

Sample Location	SB-13A	SB-14A	SB-15	SB-16
Sample Number	SSM-33	SSM-41	SSM-20	SSM-48
Sample Depth (ft)	12.0-13.5	12.0-13.5	12.0-13.5	12.0-13.5
Parameter (mg/kg)				
Arsenic	13.0	9.9	15.0	LD
Barium	LD	LD	LD	LD
Cadmium	4.4	LD	3.1	4.8
Chromium	21.0	LD	20.0	20.0 (R)
Lead	3.3	12.0 (R)	23.0	LD (*)
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	LD	LD (R)	LD	LD

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
2. (R) indicates spike sample recovery was not within control limits.
3. (*) indicates duplicate analysis was not within control limits.

6.3 Solvent Tank Farm

Soil samples were collected from borings drilled in and around the solvent tank farm. Results of laboratory analyses are presented in this section in tabular form. A graphic representation of total volatile organics is shown in the tank farm cross sections. Figure 10 shows the locations of the cross sections.

Tables 13, 14 and 15 present the organic analyses of soil samples collected between 1.5 to 17.5 ft. below grade in the northern area of the tank farm. The results are shown in cross section "A-A", Figure 11. The total VOC concentrations range from 0.021 mg/kg to 969.0 mg/kg

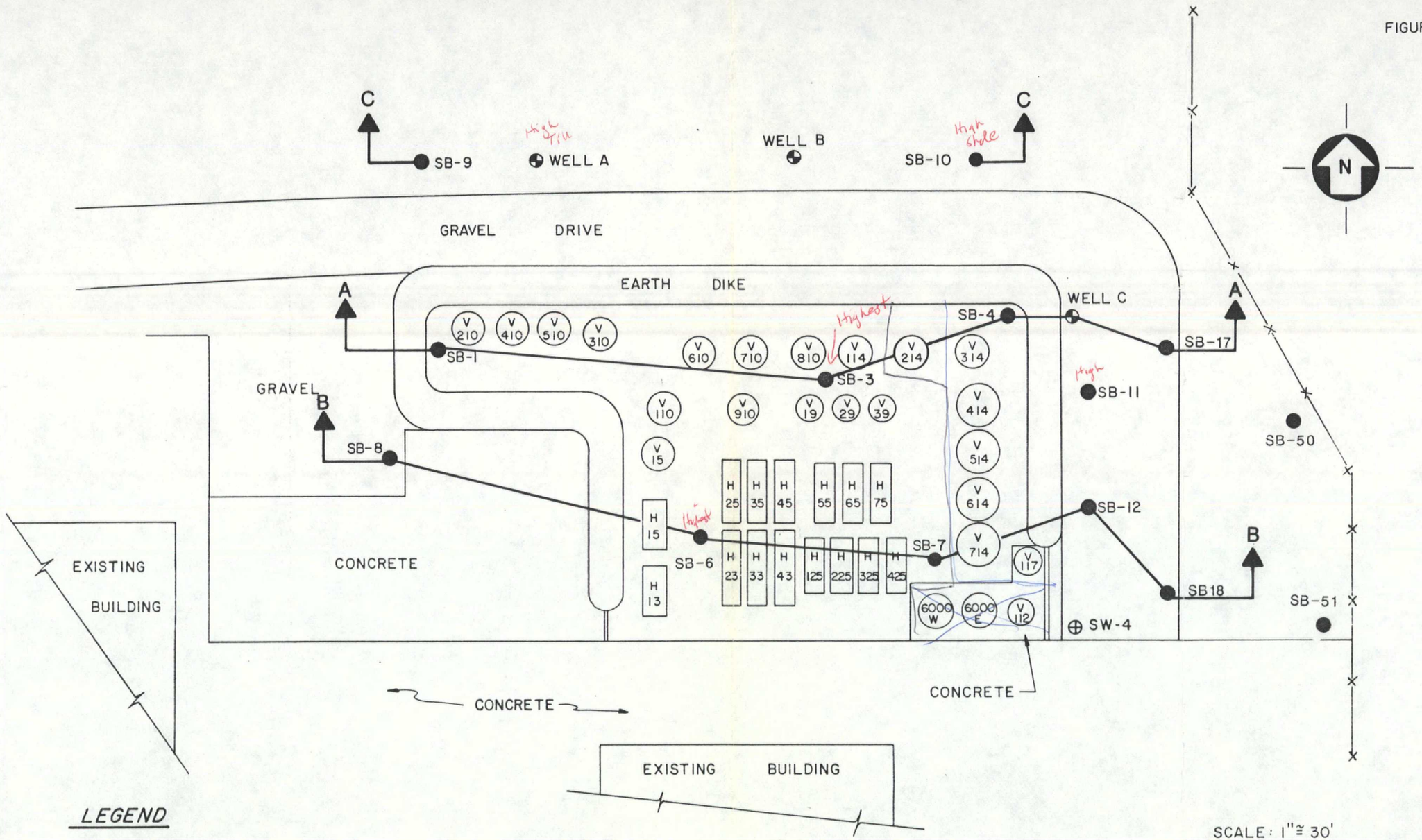
Organic analytical results of soil samples collected between 1.5 to 24.0 ft. below grade inside and outside the southern portion of the tank farm are shown in Tables 16 and 17. The results are shown in cross section "B-B", Figure 12. The total organic concentrations range from 0.454 mg/kg to 1006 mg/kg. SB-18 is located in the vicinity of the french drain which is connected to the API holding tank.

Table 18 shows the results of organic analyses of soil samples collected from borings drilled approximately 30 foot to the north of the solvent tank farm berm. These results are shown in cross section "C-C", Figure 13. Only two samples collected from the four borings north of the tank farm contained elevated levels of VOCs. A sample collected from the Well A borehole between 7.5 to 9.0 ft. contained a total VOC concentration of 49.72 mg/kg. A second soil sample containing an elevated level of VOCs was collected from boring SB-10 at 19.0 to 20.0 ft. This sample contained 43.1 mg/kg of total VOCs. The remaining samples collected from the soil borings to the north of the tank farm contained low levels of VOCs.

Three soil samples, collected in and around the tank farm, which showed the highest VOC concentrations were selected for total metals

Associated with Solvent Farm

FIGURE Nº 10



LEGEND

- ● SB-SOIL BORING
- ⊕ MONITORING WELL (INSTALLED 1986)
- ⊕ MONITORING WELL (INSTALLED 1982)

NOTE:
STORAGE TANKS SHOWN IN APPROX. LOCATION.

SCALE: 1" ≅ 30'

CROSS SECTION LOCATIONS IN & AROUND TANK FARM

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TABLE 13

TANK FARM SOIL SAMPLING
ORGANIC ANALYSES

Sample Location	SB-1	SB-3	SB-4	SB-4	SB-4	Well C	SB-11	SB-17
Sample Number	SS-158	SS-165	SS-176	SS-176 Dup.	SS-176 Blank	SS-66	SS-93	SS-108
Sample Depth (ft)	1.5-3.0	3.0-4.5	1.5-3.0	1.5-3.0	NA	3.0-4.5	1.5-3.0	1.5-3.0
Parameter (mg/kg)								
Methylene Chloride	0.810 (J)	4.3	2.5	4.0	0.031	4.6	13.0	0.093
Acetone	5.9	8.5	5.6	4.1	0.055	7.4	11.0 (J)	0.074
2-Butanone	11.0	8.3	7.7	7.1	LD	3.2	LD	LD
Tetrachloroethylene	LD	2.1	2.2	0.990	LD	LD	15.0	0.007 (J)
Toluene	LD	LD	0.720	0.790	LD	1.4	330.0	LD
Ethyl Benzene	LD	LD	1.7	1.8	LD	1.3	110.0	LD
Total Xylene	5.2	LD	8.8	9.3	LD	6.3	490.0	LD
1,1,2-Trichloro-1,2,2-Trifluoroethane	LD	LD	LD	LD	0.020 (J)	LD	LD	0.100 (J)
Trimethylsilanol	LD	LD	LD	LD	0.007 (J)	LD	LD	LD
1,2,3-Trimethyl Benzene	LD	LD	LD	LD	LD	4.0 (J)	LD	LD
1-Ethyl-2-Methyl Benzene	LD	LD	LD	LD	LD	3.0 (J)	LD	LD
Tetrahydrofuran	LD	LD	LD	LD	LD	LD	LD	0.010 (J)
Total VOCs	22.91	23.2	29.22	28.08	0.113	31.2	969.0	0.284
OVA Reading (ppm)	200	GT1000	1000	---	---	GT1000	GT1000	8.5

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses
4. GT indicates greater than.

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TABLE 14

TANK FARM SOIL SAMPLING
ORGANIC ANALYSES

Sample Location	SB-1	SB-1	SB-1	SB-3	SB-4	SB-4	Well C
Sample Number	SS-162	SS-162 Dup.	SS-162 Blank	SS-167	SS-179	SS-179 RA	SS-70
Sample Depth (ft)	16.5-17.0	16.5-17.0	NA	12.0-13.5	12-13.5	12-13.5	16.0-17.5
Parameter (mg/kg)							
Methylene Chloride	0.260	0.480	0.031	29.0	58.0	110.0	21.0
Acetone	0.940	0.620	0.017	52.0	17.0	26.0	4.1
1,1-Dichloroethane	LD	LD	LD	LD	LD	LD	0.300 (J)
2-Butanone	0.044	0.072	LD	36.0	6.2	8.3	5.2
1,1,1-Trichloroethane	0.031	0.110	LD	42.0	LD	8.6	LD
Trichloroethylene	LD	0.026 (J)	LD	LD	LD	6.1	LD
Tetrachloroethylene	LD	0.062	LD	800.0	LD	LD	LD
Toluene	0.028	0.081	LD	32.0	LD	LD	4.5
Ethyl Benzene	LD	0.006 (J)	LD	LD	LD	LD	0.440 (J)
Total Xylene	0.006 (J)	0.015 (J)	LD	LD	LD	LD	2.0
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.200 (J)	0.200 (J)	0.020 (J)	LD	LD	LD	LD
Chloroform	LD	LD	LD	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	LD	LD	LD	LD	LD	LD
Total VOCs	1.509	1.672	0.068	991	81.2	159	37.54
OVA Reading (ppm)	3.0	---	---	GT 1000	GT 1000	---	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. RA indicates reanalysis. Sample SS-179 was reanalyzed. Samples SS-179 and SS-179 RA had low volatile organic analysis (VOA) surrogates for Toluene-D8 and Bromofluorobenzene. This indicates matrix interference. See "Water Surrogate Percent Recovery" in Appendix C.
4. NA indicates not applicable
5. Dup. indicates duplicate analyses
6. GT indicates greater than.

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TABLE 15

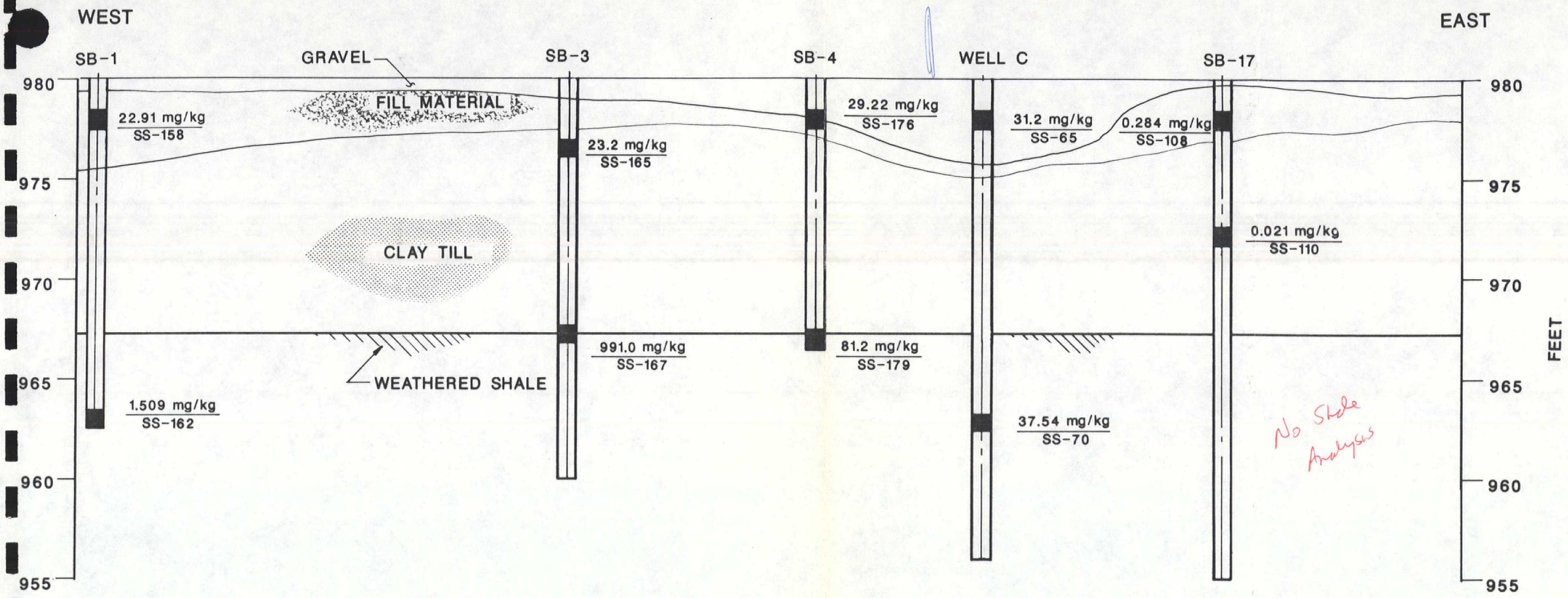
TANK FARM SOIL SAMPLING
ORGANIC ANALYSES

Sample Location	Well C	Well C	SB-11	SB-11	SB-11	SB-11	SB-17
Sample Number	SS-70 Dup.	SS-70 Blank	SS-96	SS-96 RA	SS-96 Dup.	SS-96 Blank	SS-110
Sample Depth (ft)	16.0-17.5	NA	12-13.5	12-13.5	12-0-13.5	NA	7.5-9.0
Parameter (mg/kg)							
Methylene Chloride	16.0	0.015	3.7	1.6 (J)	1.7	0.015	0.015
Acetone	2.8	0.002 (J)	13.0	5.4 (J)	1.7	0.005 (J)	0.006 (J)
1,1-Dichloroethane	0.300 (J)	LD	LD	LD	LD	LD	LD
2-Butanone	3.2	0.003 (J)	3.9	8.3	2.7	0.002 (J)	LD
1,1,1-Trichloroethane	LD	LD	LD	LD	0.390 (J)	LD	LD
Trichloroethylene	LD	LD	LD	LD	LD	LD	LD
Tetrachloroethylene	0.320 (J)	LD	2.2 (J)	1.4 (J)	1.1 (J)	LD	LD
Toluene	10.0	LD	54.0	32.0	25.0	0.001 (J)	LD
Ethyl Benzene	0.720	LD	25.0	15.0	12.0	LD	LD
Total Xylene	3.3	LD	110.0	70.0	51.0	LD	LD
1,1,2-Trichloro-1,2,2-Trifluoroethane	LD	LD	LD	LD	LD	LD	LD
Chloroform	LD	0.001 (J)	LD	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	LD	LD	2.8 (J)	1.4 (J)	LD	LD
Styrene	LD	LD	LD	LD	LD	0.003 (J)	LD
Total VOCs	36.64	0.021	211.8	136.5	96.99	0.026	0.021
OVA Reading (ppm)	---	---	+1000	---	---	---	15.4

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. NA indicates not applicable
4. Dup. indicates duplicate analyses
5. Sample number SS-96 was reanalyzed (SS-96 RA) because VOA surrogates were outside QC limits. Sample SS-96 RA surrogates were within QC limits.

FIGURE 11



CROSS-SECTION A-A

TANK FARM BORINGS
VOC CONCENTRATIONS

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TABLE 16

TANK FARM SOIL SAMPLING
ORGANIC ANALYSES

Sample Location	SB-8	SB-8	SB-8	SB-6	SB-7	SB-12	SB-18
Sample Number	SS-122	SS-122 Dup.	SS-122 Blank	SS-171	SS-181	SS-101	SS-116
Sample Depth (ft)	1.5-3.0	1.5-3.0	NA	1.5-3.0	1.5-3.0	3.0-4.5	3.0-4.5
Parameter (mg/kg)							
Methylene Chloride	1.1	1.0 (J)	0.026	0.980	3.6	2.2	14.0
Acetone	4.3	5.5	0.015	2.9	12.0	19.0	3.5
Trans-1,2 Dichloroethylene	LD	0.430 (J)	LD	LD	LD	1.7	LD
2-Butanone	4.7	8.8	LD	5.6	6.3	6.3	5.3
1,1,1 Trichloroethane	LD	LD	LD	LD	7.0	LD	6.0
Trichloroethylene	LD	LD	LD	LD	17.0	LD	7.7
4-Methyl-2-Pentanone	LD	LD	LD	LD	LD	LD	4.3
Tetrachloroethylene	4.5	8.0	LD	LD	LD	LD	2.1
Toluene	LD	LD	LD	LD	65.0	LD	26.0
Ethyl Benzene	LD	LD	LD	1.3	13.0	0.540	8.1
Total Xylene	LD	LD	LD	3.0	67.0	4.5	47.0
1,1,2 Trichloro-1,2,2 Trifluoroethane	LD	LD	0.020 (J)	LD	LD	LD	LD
Trimethylsilanol	LD	LD	0.005 (J)	LD	LD	LD	LD
1,1,2 Trimethylcyclohexane	LD	9.0	LD	LD	LD	LD	LD
2,3,4-Trimethylhexane	LD	22.0	LD	LD	LD	LD	LD
Total VOCs	14.6	54.73	0.066	13.780	190.9	34.24	124.0
OVA Reading (ppm)	100	--	--	GT 1000	GT 1000	GT 1000	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses
4. Sample number SS-122 and SS-122 Dup were analyzed outside the 14 day holding time. Actual holding time was 16 days.
5. GT indicates greater than.

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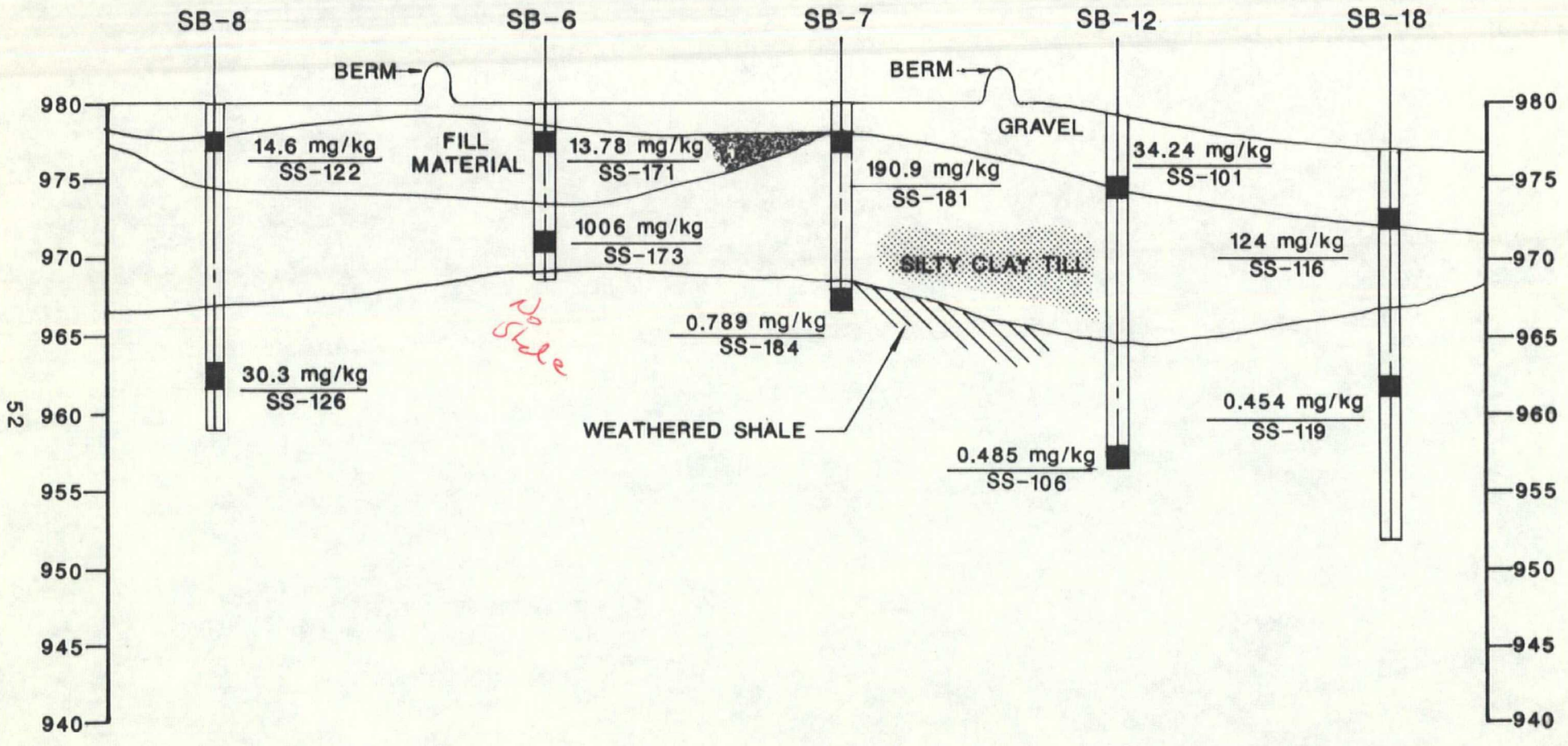
TABLE 17

TANK FARM SOIL SAMPLING
ORGANIC ANALYSES

Sample Location	SB-8	SB-6	SB-7	SB-12	SB-18
Sample Number	SS-126	SS-173	SS-184	SS-106	SS-119
Sample Depth (ft)	16.5-17.0	7.5-9.0	12.0-13.5	23.5-24.0	16.5-17.0
Parameter (mg/kg)					
Methylene Chloride	1.4	27.0	0.270	0.078	0.160
Acetone	4.9	37.0	0.200	0.250	0.170
2-Butanone	5.0	32.0	0.036 (J)	0.023 (J)	0.019 (J)
1,1,1 Trichloroethane	LD	LD	0.090	LD	0.011 (J)
Tetrachloroethylene	19.0	LD	LD	LD	LD
Toluene	LD	340.0	0.073	0.051	0.026
Ethyl Benzene	LD	120.0	0.005 (J)	0.012 (J)	LD
Total Xylene	LD	450.0	0.025 (J)	0.071	0.028
1,1,2 Trichloro-1,2,2 Trifluoroethane	LD	LD	0.050 (J)	LD	0.030 (J)
Trimethylsilanol	LD	LD	0.040 (J)	LD	0.010 (J)
Total VOCs	30.3	1006.	0.789	0.485	0.454
OVA Readings (ppm)	20	GT1000	120	90	30

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses
4. NA indicates not applicable
5. GT indicates greater than



CROSS SECTION B-B

FIGURE 12

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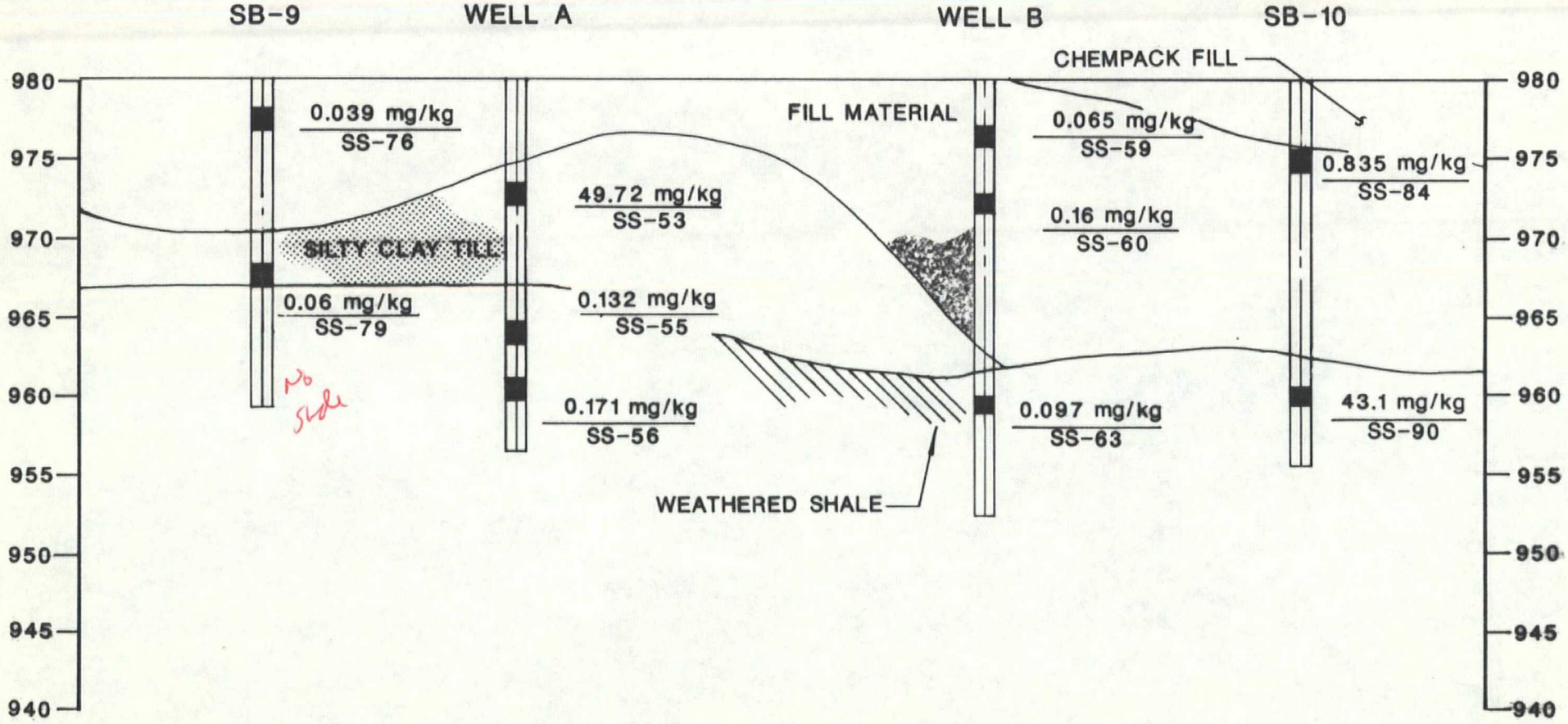
TABLE 18

SOIL SAMPLING
OUTSIDE TANK FARM BERM
ORGANIC ANALYSES

Sample Location	SB-9	SB-9	Well A	Well A	Well A	Well B	Well B	Well B	Well B	Well B	SB-10	SB-10
Sample Number	SS-76	SS-79	SS-53	SS-55	SS-56	SS-59	SS-59 Dup	SS-59 Blank	SS-60	SS-63	SS-84	SS-90
Sample Depth (ft)	1.5-3.0	12.0-13.5	7.5-9.0	16.5-17.0	20.0-20.5	3.0-4.5	3.0-4.5	NA	7.5-9.0	20.5-21.0	4.5-6.0	19.0-20.0
Parameter (mg/kg)												
Methylene Chloride	0.017	.021	1.9	0.005	0.011	0.007	0.010	0.023	0.007	0.011	0.058	5.1
Acetone	0.020	.035	0.820 (J)	0.030	0.026	0.033	0.043	0.076	0.110	0.070	0.570	8.5
2-Butanone	LD	.004 (J)	2.4	0.005	LD	0.005 (J)	LD	LD	0.027	0.005 (J)	0.160	3.8
1,1,1-Trichloroethane	LD	LD	LD	0.006	LD	LD	LD	LD	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	LD	LD	LD	0.005	LD	LD	LD	LD	LD	LD	LD
2-Hexanone	LD	LD	LD	0.005 (J)	LD	LD	LD	LD	LD	0.005 (J)	LD	LD
1,1 Dichloroethane	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	0.009(J)	LD
Toluene	0.002 (J)	LD	9.8	0.032	0.042	LD	LD	LD	0.004 (J)	0.001 (J)	0.038	1.1
Ethyl Benzene	LD	LD	5.8	0.007	0.013	LD	LD	LD	LD	LD	LD	3.6
Total Xylenes	LD	LD	29.0	0.032	0.055	LD	LD	LD	0.002 (J)	LD	LD	18.0
1,1,2-Trichloro-1,2,2-Trifluoroethane	LD	LD	LD	0.010 (J)	0.010 (J)	0.020 (J)	0.40 (J)	LD	0.010 (J)	LD	LD	LD
Trichlorofluoromethane	LD	LD	LD	LD	0.009 (J)	LD	LD	LD	LD	LD	LD	LD
Carbon Disulfide	LD	LD	LD	LD	LD	LD	LD	LD	LD	0.005 (J)	LD	LD
Propyl Benzene	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	3.0 (J)
Total VOCs	0.039	0.06	49.72	0.132	0.171	0.065	0.453	0.099	0.16	0.097	0.835	43.1
OVA Reading (ppm)	3.0	4.0	GT 1000	68	2.6	0	--	--	55	1.5	50	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses.
4. NA indicates not applicable.
5. GT indicates greater than.



CROSS SECTION C-C

and EP toxicity analyses. These results are presented in Tables 19 and 20, respectively. Low concentrations of lead were detected in each of the three samples. EP toxicity tests for lead showed less than detection levels. Each of the three soil samples also contained low levels of total arsenic close to the method detection limit. Arsenic was not detected in EP toxicity tests. Elevated levels of barium were detected in two of the samples. EP toxicity tests for barium showed low levels of barium in the leachate, 0.55 and 1.2 mg/l, respectively. Based on the low levels of total metals and EP toxic metals detected in the three samples containing the highest total VOCs, it was determined that additional samples would not be analyzed for metals.

6.4 "Chem-Pack" Fill

The area graded with "Chem-Pack" material was defined by visual inspection and sampling. The approximate areal extent of the "Chem-Pack" is shown in Drawing No. 1, Appendix A. Results of inorganic analyses of a composite sample of "Chem-Pack" material and of a sample collected at approximately 3 ft. below the "Chem-Pack" fill are shown in Table 21, samples KP-3 and KP-10 respectively. Results of "Chem-Pack" samples encountered during the drilling of SB-10 (samples SSM-81 and SSM-82) and of soil (sample SSM-84) beneath the "Chem-Pack" are shown in Table 21. Table 21 shows that the "Chem-Pack" material is composed primarily of iron. Other metals in order of decreasing concentrations include manganese, zinc, copper, nickel, barium, chromium and cadmium.

A sample of soil from boring SB-21 collected beneath the "Chem-Pack" at a depth of 17.0 to 18.5 ft. showed decreased levels of these metals except that the concentration of manganese was higher than in the "Chem-Pack" fill. The concentration of arsenic was less than detected in the background soil samples.

While sampling the "Chem-Pack" fill area, two samples were visually anomalous to the "Chem-Pack" material. These samples were

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TABLE 19

TANK FARM SOIL SAMPLING
METALS ANALYSES

Sample Location	SB-3	SB-6	SB-11
Sample Number	SSM-167	SSM-173	SSM-92
Sample Depth (ft)	12.0-13.5	7.5-9.0	0-1.5
Parameter (mg/kg)			
Arsenic	19	15	13
Barium	LD	45	202
Cadmium	LD	LD	4.8
Chromium (T)	LD	LD	LD
Lead	23	10	5.3
Mercury	LD	LD	LD
Selenium	LD	LD	LD
Silver	LD	LD	LD
% Solids	88	88	93

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

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TABLE 20

TANK FARM SOIL SAMPLING
EP TOXICITY ANALYSES

Sample Location	SB-3	SB-6	SB-11
Sample Number	SSM-167	SSM-173	SSM-92
Sample Depth (ft)	12.0-13.5	7.5-9.0	0-1.5
Parameter (mg/l)			
Arsenic	LD	LD	LD
Barium	LD	0.55	1.2
Cadmium	LD	LD	LD
Chromium (T)	LD	LD	LD
Lead	LD	LD	LD
Mercury	LD	LD	LD
Selenium	LD	LD	LD
Silver	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

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TABLE 21

"CHEM PACK" SAMPLES
INORGANIC ANALYSES

Sample Location	See Note 1	SB-21	SB-10	SB-10	SB-10
Sample Number	KP-3	KP-10 (2)	SSM-81	SSM-82	SSM-84
Sample Depth (ft)	See Note 1	17.0-18.5	0-1.5	1.5-3.0	4.5-6.0
Parameter (mg/kg)					
Arsenic	LD (*)	6.2 (*)	LD	LD	LD
Barium	79 (*)	87 (*)	119	54	121
Cadmium	6.3	LD	12	6.5	6.5
Calcium	--	18,400	--	--	--
Chromium (T) (R)	70	18	255	27	40
Copper (R)	152	35	--	--	--
Iron	61,100	27,200	--	--	--
Lead	72	22 (S)	110 (*)	48.9 (S)	73 (*)
Manganese (R)	453	533	--	--	--
Mercury	LD	LD	LD	LD	LD
Nickel	84	28	--	--	--
Selenium	LD	LD	LD (R)	LD (R)	LD (R)
Silver	LD	LD	LD	LD	LD
Zinc (R) (*)	289	103	--	--	--
% Solids	63	80	42	84	62

NOTES:

1. Sample number KP-3 was a composite sample of "Chem-Pack" material collected from soil borings SB-19, SB-20, SB-21, SB-25 and SB-26.
2. Sample KP-10 was a soil sample collected below the "Chem-Pack".
3. (*) indicates duplicate analysis was not within control limits.
4. (R) indicates spike sample recovery was not within control limits.
5. (S) indicates concentration determined by method of standard addition.
6. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample refer to the laboratory results in Appendix C.
7. (--) indicates sample not analyzed.

submitted for individual metals analyses. The results of these analyses are shown in Table 22. Sample number KP-3 appeared to be foundry sand and did not contain copper as detected in "Chem-Pack". Sample KP-2 appeared to be lime and contained lower levels of the "Chem-Pack" metals except for arsenic and chromium.

The composite sample of "Chem-Pack" and the soil sample collected beneath the "Chem-Pack" were submitted for EP toxicity analysis. In addition to the standard suite of EP toxic metals, copper, iron, manganese, zinc, fluoride, sulfate, chloride, nitrate and phosphorous were also run on the leachate. Results of the EP toxicity analysis are shown in Table 23. EP toxicity analyses of the anomalous samples collected from the "Chem-Pack" fill area are shown in Table 24. Leachate contained less than EP toxic levels of metals.

6.5 Northwest Fill Area

The approximate areal extent of the northwest fill area is shown on Drawing No. 1. The areal and vertical extent of the fill was determined from visual inspection and laboratory analyses of soil samples collected from borings in the area. The fill area is comprised of debris, rubble, foundry slag and sand.

Soil borings drilled in the northwest fill area were composited into two samples for laboratory analysis (Table 25). In addition to the VOCs required by the USEPA approved sampling plan, samples of the fill were analyzed for polynuclear aromatics (PAH). These chemicals have been detected in foundry materials at other sites. Table 26 contains a list of the PAH analytes.

VOC concentrations in samples from the northwest fill, shown in Table 25, are similar to the concentrations detected in the field and the laboratory blanks. Laboratory blank results are shown in Section 6.1 of this report. No PAHs were detected in the samples.

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TABLE 22

"CHEM PACK" SAMPLES
INORGANIC ANALYSES

Sample Location	SB-25	SB-26
Sample Number	KP-1	KP-2
Sample Depth (ft)	4.5 - 6.0	1.5 - 3.0
Parameter (mg/kg)		
Arsenic (*)	LD	8.1
Barium (*)	51	73
Cadmium	3.9	LD
Calcium	14,700	--
Chromium (T) (R)	11	207
Copper (R)	LD	51
Iron	38,100	26,300
Lead	23 (S)	69
Manganese (R)	440	552
Mercury (R)	LD	LD
Nickel	LD	LD
Selenium	LD	LD
Silver	LD	LD
Zinc (R) (*)	41	144
% Solids	77	61

NOTES:

1. Samples KP-1 and KP-2 were collected in the "Chem-Pack" fill area but not composited with sample KP-3 because of anomalous appearance. These samples were analyzed individually.
2. (*) indicates duplicate analysis was not within control limits.
3. (R) indicates spike sample recovery was not within control limits.
4. (S) indicates concentration determined by method of standard addition.
5. -- indicates parameter not analyzed.
6. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

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TABLE 23

"CHEM-PACK"
EP TOXICITY ANALYSES

Sample Location	See Note 1	SB-21
Sample Number	KP-3	KP-10
Sample Depth (ft)	See Note 1	17-18.5
Parameter (mg/l)		
Arsenic	LD	LD
Barium	0.270	0.540
Cadmium	LD	LD
Chromium (T)	LD	LD
Copper (2)	0.066	0.036
Iron (2)	LD	1.950
Lead	LD	0.014
Manganese (2)	1.59	10.6
Mercury	LD	LD
Nickel (2)	0.202	0.042
Selenium	LD	LD
Zinc (2)	0.108	0.126
Fluoride (2)	0.8	0.3
Sulfate (2)	1330	18
Chloride (2)	56	47
Nitrate (2)	4.7	LD
Phosphorus (2)	LD	LD

NOTES:

1. Sample number KP-3 is a composite sample of "Chem-Pack" material collected from soil borings SB-19, SB-20, SB-21, SB-25 and SB-26.

2. This parameter is not an EP Toxic chemical. Samples were digested by the USEPA's Extraction Procedure (EP) and the leachate was analyzed for this parameter.

3. LD indicates less than the detection limit. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

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TABLE 24

"CHEM PACK" SAMPLES
INORGANIC EP TOXICITY ANALYSES

Sample Location	SB - 25	SB-26
Sample Number	KP-1	KP-2
Sample Depth (ft)	4.5 - 6.0	1.5 - 3.0
Parameter (mg/l)		
Arsenic	LD	LD
Barium	0.210	0.25
Cadmium	LD	LD
Chromium	LD	3.86
Copper (2)	0.018	0.060
Iron (2)	7.2	0.17
Lead	LD	LD
Manganese (2)	3.95	0.898
Mercury	LD	LD
Nickel (2)	0.047	LD
Selenium	LD	LD
Zinc (2)	0.081	0.075
Flouride (2)	0.2	0.5
Sulfate (2)	57	900
Chloride (2)	2	14
Nitrate (2)	LD	7
Phosphorous (2)	LD	LD

NOTES:

1. Samples KP-1 and KP-2 were collected in the "Chem Pack" fill area but not composited with sample KP-3 because of anomalous appearance. These samples were analyzed individually.

2. This parameter is not EP Toxic. Samples were digested by the USEPA's Extraction Procedure (EP) and the leachate was analyzed for this parameter.

3. LD indicates less than the detection limit. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

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TABLE 25

NORTHWEST FILL AREA
ORGANIC ANALYSES
COMPOSITE SAMPLES

Sample Location	See Note 1	See Note 1	See Note 1	See Note 2
Sample Number	SS-120	SS-120	SS-120	SS-119
Sample Depth	See Note 1	Duplicate	Blank	See Note 2
Parameter (ug/kg)				
Methylene Chloride	10	9	31	7
Acetone	8 (J)	7 (J)	6 (J)	10
Toluene	3 (J)	3 (J)	1 (J)	2 (J)
Trimethylsilanol	LD	LD	3 (J)	LD
Polynuclear Aromatics (PAH)	LD	LD	LD	LD

NOTES:

1. Sample number SS-120 is a composite sample of the fill collected from soil borings SB-28, SB-29 and SB-30.
2. Sample number SS-119 is a composite sample of the fill collected from soil borings SB-31, SB-32 and SB-33.
3. LD indicates less than the deletion limit. For the detection limit of a specific sample refer to the laboratory results in Appendix C.
4. (J) indicates compound identified at a concentration estimated below the detection limit.

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TABLE 26

POLYNUCLEAR AROMATIC ANALYTES

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)Anthracene
Benzo(a)Pyrene
3,4-Benzofluoranthene
Benzo(shi)Perylene
Benzo(k)Fluoranthene
Chrysene
Dibenzo(a,h)Anthracene
Fluoranthene
Fluorene
Indeno(1,2,3cd) Pyrene
Naphthalene
Phenanthrene
Pyrene
2-Methylnaphthalene

Four samples collected from the northwest fill area were submitted for individual analyses. The decision to submit these samples for individual analyses was based on either anomalous appearance or OVA readings above background. The results of the individual analyses are summarized in Table 27. VOC concentrations were at or near the concentrations of VOCs detected in the method and field blanks. PAHs were not detected. OVA readings are presented in Table 27. The OVA readings above background may be due to the presence of natural organic materials.

The composite samples collected of the northwest fill were submitted for total metals analyses and the results are shown in Table 28. Concentrations of arsenic, barium, cadmium and chromium were at or near background levels. The samples contained iron, copper, lead, manganese and nickel, and no selenium or silver was detected. A low level of mercury (0.34 mg/kg) was detected in the sample composited from soil borings SB-31, SB-32 and SB-33.

EP toxicity analyses were performed on samples of the fill. In addition to the eight EP toxic metals, the leachate was analyzed for additional parameters (Table 29). Less than EP toxic levels of metals and low concentrations of sulfates were detected in the leachate.

6.6 Underground Cistern

Pursuant to EA's engineering report, "Closure Plan for Underground Cistern", liquid and sediment were removed from the cistern and disposed of as a hazardous waste. Soil samples were collected from soil borings drilled around the cistern. The interior of the tank was inspected by the HCC plant manager and the results of the inspection are included in this section.

6.6.1 Cistern Description and General Conditions

The underground cistern is located east of the HCC processing building. The cistern is a 5 ft. high oval shaped concrete tank,

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TABLE 27

NORTHWEST FILL AREA
ORGANIC ANALYSES

Sample Location	SB-29	SB-29	SB-29	SB-30	SB-31	SB-31
Sample Number	SS-84	SS-84RA	SS-85	SS-112	SS-113	SS-113RA
Sample Depth (ft)	2.0-3.5	2.0-3.5	3.5-5.0	8.0-9.5	22.5-23.5	22.5-23.5
Parameter (ug/kg)						
Methylene Chloride	LD	LD	18	LD	8	9
Acetone	13	11	34	76	24	27
Toluene	5	3(J)	21	1(J)	2(J)	2(J)
Trimethylsilanol (2)	10	10(J)	LD	10(J)	LD	LD
2-Butanone	LD	5 (J)	LD	7 (J)	LD	LD
Polynuclear Aromatics	LD	--	--	LD	LD	--
OVA Reading (ppm)	55	--	2.0	340	600	--

NOTES:

1. RA indicates reanalysis by laboratory.
2. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific compound refer to the laboratory results in Appendix C.
3. (J) indicates compound identified at a concentration below the detection limit.
4. Surrogate recoveries for sample SS-84 and SS-113 were outside QC limits due to matrix interference. Sample was reanalyzed (SS-84A and SS-113RA) and surrogates were also outside QC limits due to matrix interference.
5. -- indicates parameter not analyzed.

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TABLE 28

NORTHWEST FILL AREA
METALS ANALYSES
COMPOSITE SAMPLES

Sample Location	See Note 1	See Note 1	See Note 1	See Note 2
Sample Number	SS-120 Comp.	SS-120 Comp.	SS-120 Comp.	SS-119 Comp.
Sample Depth (ft)	See Note 1	Duplicate	Blank	See Note 2
Parameter (mg/kg)				
Arsenic (*)	21	23	LD	15
Barium (*)	172	95	LD	61
Cadmium	3.9	3.3	LD (*)	LD
Chromium (R)	26	22	LD	LD
Copper (R)	78	90	LD	136
Iron	61,200	52,100	LD	52,600
Lead	273	184	LD	167
Manganese (R)	501	430	LD	537
Mercury (R)	LD	LD	LD	0.34
Nickel	22	20	LD	21
Selenium	LD	LD	LD	LD
Silver	LD	LD	LD	LD
Zinc (R) (*)	1,230	872	LD	251
% Solids	89	89	100	89

NOTES:

1. Sample number SS-120 comp. is a composite sample of the fill collected from soil borings SB-28, SB-29 and SB-30.
2. Sample number SS-119 is a composite sample of the fill collected from soil borings SB-31, SB-32 and SB-33.
3. (*) indicates duplicate analysis was not within control limits.
4. (R) indicates spike sample recovery was not within control limits.
5. LD indicates less than the detection limit. For the detection limit of a specific compound refer to the laboratory results in Appendix C.

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TABLE 29

NORTHWEST FILL AREA
EP TOXICITY ANALYSES

	Composite Samples			
Sample Location	See Note 1	See Note 1	See Note 1	See Note 2
Sample Number	SS-120 Comp.	SS-120 Comp.	SS-120 Comp.	SS-119 Comp.
Sample Depth	See Note 1	Duplicate	Blank	See Note 2
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	0.130	0.150	LD	0.210
Cadmium	LD	LD	LD	LD
Chromium	LD	LD	LD	LD
Copper (3)	0.038	0.030	0.056	0.019
Iron (3)	0.380	0.350	LD	13.9
Lead	0.026	0.024	0.010	0.050
Manganese (3)	2.280	2.940	LD	3.94
Mercury	LD	LD	LD	LD
Nickel (3)	0.092	0.130	LD	0.081
Selenium	LD	LD	LD	LD
Zinc (3)	1.070	2.280	0.129	3.7
Fluoride (3)	1.0	1.1	LD	0.1
Sulfate (3)	38.0	41.	15	23.0
Chloride (3)	2.0	LD	LD	LD
Nitrate (3)	LD	LD	0.3	0.1
Phosphorus (3)	LD	LD	LD	LD

NOTES:

1. Sample number SS-120 comp. is a composite sample of the fill collected from soil borings SB-28, SB-29 and SB-30.

2. Sample number SS-119 is a composite sample of the fill collected from soil borings SB-31, SB-32 and SB-33.

3. This parameter is not an EP Toxic chemical. Samples were digested by the USEPA's Extraction Procedure (EP) and the leachate was analyzed for this parameter.

4. LD indicates less than the deletion limit. For specific sample detection limits refer to the laboratory results in Appendix C.

approximately 9 ft. in length by approximately 6 ft. wide with a 2 piece concrete slab cover. A cross section of the cistern is shown in Figure 14. The tank has one interior baffle and one 4 in. diameter inlet pipe. The depth from grade and to the concrete cover of the cistern is approximately eight ft. The distance from grade to the bottom of the cistern is approximately 13 ft.

There are two, approximately 24 in., riser manways extending from the top of the cistern to grade where they are covered by a steel plate. The inlet pipe to the cistern is located approximately 4 ft. from the bottom of the tank.

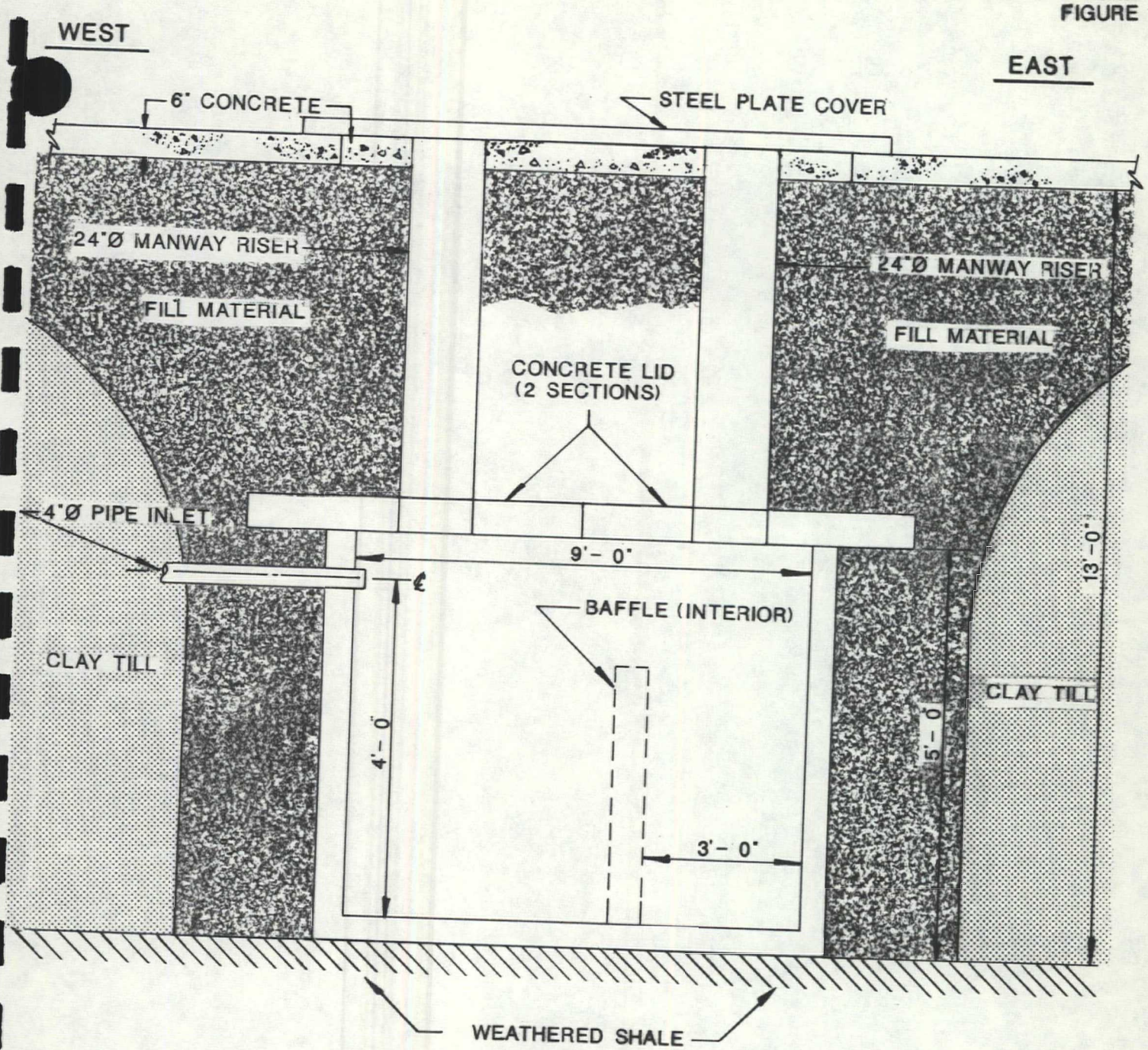
The concrete structure of the tank has deteriorated and reinforcing wire is exposed in certain sections. There is evidence of synthetic caulking and/or grout applied at the lid to tank wall joints. Prior to pumping, there was approximately 13 inches of sediment in the west compartment. During the inspection, there was liquid flowing through the inlet pipe at a rate of approximately 5 gallons per hour. A layer of hydrocarbons was observed floating on the liquid entering the cistern and on the liquid in the cistern prior to pumping. The hydrocarbon was sampled and submitted to the laboratory for analysis.

Infiltration through the walls of the cistern and the manway risers was observed during the inspection. Prior to the inspection, the tank was twice pumped empty.

The cistern was once used as secondary containment for spills occurring in the HCC processing building and floor drains and trenches located in the processing building were connected to the cistern. Liquid drained by gravity from floor drains to the cistern. Drawing No. 2 shows the approximate locations of the drains in the processing building as well as the interconnecting piping to the cistern.

The floor drains were sealed in 1982 and additional concrete was placed in each floor/trench drain in September 1986 under EA direction.

FIGURE 14



NOTE

1. DIMENSIONS SHOWN ARE APPROXIMATE.

UNDERGROUND CISTERN CROSS SECTION

N.T.S

Groundwater Seepage

Prior to sampling, the level of liquid in the cistern was approximately 1 ft. below grade, as measured in the riser manways. In April 1986, the tank was emptied but it refilled to approximately 1 ft. below grade. In September 1986, the liquid was again removed from the cistern and HCC retained an industrial waste contractor to vacuum the sediment from the cistern. At this time, the inlet pipe to the cistern was plugged in accord with EA's May 20, 1986 letter to OEPA.

6.6.2 Cistern Liquid and Sediment Sampling

Samples of liquid and sediment in the cistern were collected and analyzed in accordance with the protocol described in EA's engineering report, "Closure Plan for Underground Cistern".

The results of organic analyses of samples collected of the liquid in the cistern (CS-1) and entering the cistern through the inlet pipe (CS-6) are shown in Table 30. VOCs and a floating layer of mineral spirits were detected in both samples.

Results of metals analyses conducted on liquid collected from the cistern are shown in Table 31. Low levels of barium, chromium and mercury were detected in the liquid.

Analyses of residue collected from the cistern are shown in Tables 32 and 33. Both VOCs and heavy metals were detected in the residue. An EP toxicity analysis of the residue was performed and the results are shown in Table 34. Based on these results, the residue is not EP toxic.

6.6.3 Soil Sampling

In April/May 1986, six borings, SBC-1, SBC-2, SBC-3, SBC-4, SBC-5 and SBC-6 were drilled in the area of the cistern to determine the extent of soil contamination (Drawing No. 1). The cistern closure plan required that a boring be drilled through the bottom of the tank, however, due to the occurrence of standing water in the tank, it was determined that this boring should not be drilled.

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TABLE 30

SAMPLING RESULTS
ORGANIC ANALYSES

Sample Location	Cistern	Cistern Inlet Pipe
Sample Number	CS-1	CS-6
Parameter (mg/l)		
Acetone	980.0	510.0
2-Butanone	360.0	440.0
Methylene Chloride	1300.0	300.0
Toluene	39.0 (J)	110.00
Xylene	LD	77.0
Butyl Acetate	LD	60.0
Ethyl Benzene	LD	16.0
4-Methyl, 2-Pentanone	LD	1100.0
Hexanone	LD	79.0
Mineral Spirits	SEE NOTE 3	
TOC	2760.0	--
TOX	23.0	--

NOTES:

1. LD indicates less than the detection limit.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
3. Laboratory analysis identified floating oil layer on samples CS-1 and CS-6 as mineral spirits.
4. -- indicates parameter was not analyzed.

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TABLE 31

CISTERN LIQUID
METALS ANALYSES

Sample Number	CS-1
Parameter (mg/l)	
Arsenic	LD
Barium	0.120
Cadmium	LD
Chromium	0.048
Lead	LD
Mercury	0.6
Selenium	LD
Silver	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

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TABLE 32

CISTERN RESIDUE
ORGANIC ANALYSES

Sample Number	CSS-1
Parameter (mg/kg)	
Acetone	9,300.0
Methyl Ethyl Ketone	8,000.0
1,1,1-Trichloroethane	34,000.0
Methylene Chloride	140,000.0
Trichloroethylene	8,100.0 (J)
Toluene	21,000.0
Xylene	22,000.0
Ethyl Benzene	4,500.0

NOTES:

1. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific compound refer to the laboratory reports in Appendix C.

2. J indicates compound identified at a concentration estimated below the detection limit.

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TABLE 33

CISTERN RESIDUE
METALS ANALYSES

Sample Number	CSS-1
Parameter (mg/kg)	
Arsenic	17
Barium	4630
Cadmium	92
Chromium	3390
Lead	7130
Mercury	3.5
Selenium	LD
Silver	LD
% Solids	35

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.

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TABLE 34

CISTERN RESIDUE
EP TOXICITY ANALYSES

Sample Number	CSS-1
Parameter (mg/l)	
Arsenic	LD
Barium	0.490
Cadmium	0.300
Chromium	0.200
Lead	LD
Mercury	LD
Selenium	LD (R)
Silver	0.010

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.

2. (R) indicates spike sample recovery was not within control limits.

Inspection of the cistern and the occurrence of liquid through the inlet pipe and infiltration through the cistern walls, lid and extension manways, indicates that perched water infiltrates the interconnecting piping to the cistern and that perched water is found in the fill around the cistern. In EA's August 1986 engineering report, additional borings were proposed around the interconnecting piping to the cistern in and around the processing building at the HCC facility. These borings are identified as SB-36, SB-36A, SB-37, SB-34, SB-35 and SB-38 and are shown in Drawing No. 1. Soil and/or perched water samples were collected during the drilling of these borings.

In accordance with the closure plan, soil samples were collected in borings at three elevations around the cistern as follows:

0.5 to 2.0 ft.
8.0 to 9.5 ft.
13.0 to 14.5 ft.

These elevations correspond to: 1) the soil just beneath the concrete pad in the area of the cistern; 2) the lid of the cistern; and 3) the bottom of the cistern. Per the Closure Plan, four soil borings were to be drilled around the cistern. Two additional borings SBC-5 and SBC-6 (Drawing No. 1) were drilled further away from the cistern to determine the vertical and areal extent of soil contamination.

The organic analyses of samples from the cistern borings are shown in Tables 35-37. Figure 15 shows the total VOC concentrations in a vertical cross section of the cistern borings. All borings except SBC-4 are shown. Concentrations of VOCs ranged from 6700 mg/kg at grade near the cistern to 0.945 mg/kg at 12.0 to 13.5 ft. in boring SBC-6, approximately 30 ft. east of the cistern. Figure 15 shows that the VOC concentrations decrease with depth below grade and distance from the cistern. VOC concentrations in soil boring SBC-6 approach background levels (0.945 mg/kg) at 12.0 to 13.5 ft. below grade.

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TABLE 35

CISTERN BORINGS
ORGANIC ANALYSES

mostly floaters

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4	SBC-5	SBC-6
Sample Number	SS-128	SS-133	SS-137	SS-144	SS-148	SS-152
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/kg)						
Methylene Chloride	1.6	730	78 (J)	63	41	6.8
Acetone	23	LD	LD	240	160	LD
2-Butanone	10	LD	LD	320	130	9 (J)
1,1,1 Trichloroethane	2.4	LD	160	LD	LD	LD
4-Methyl-2 Pentanone	4.3	LD	LD	LD	19	LD
Tetrachloroethylene	15	LD	280	330	LD	9.9
Toluene	14	2600	1600	91	7.2	47
Chlorobenzene	18	LD	LD	LD	LD	LD
Ethyl Benzene	4.2	670	510	24 (J)	1.3 (J)	20
Xylene	19	2700	2000	130	6.6	120
Total VOCs	111.5	6700	4628	1198	365.1	212.7
OVA Readings (ppm)	GT 1000	GT 1000	GT 1000	GT 1000	GT 1000	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. GT indicates greater than.

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TABLE 36

CISTERN BORINGS
ORGANIC ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4	SBC-5	SBC-6
Sample Number	SS-131	SS-135	SS-139	SS-146	SS-150	SS-154
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5	6.5-8.0	8.0-9.0
Parameter (mg/kg)						
Methylene Chloride	380	0.7	84	1.7	--	--
Acetone	1000	5.3	45	6.9	--	--
2-Butanone	1500	5.8	76	9.3	--	--
1,1,1 Trichloroethane	LD	LD	5	LD	--	--
4-Methyl-2 Pentanone	LD	LD	27	LD	--	--
Tetrachloroethylene	LD	LD	4.2	LD	--	--
Toluene	680	LD	41	1.5	--	--
Chlorobenzene	LD	LD	LD	LD	--	--
Ethyl Benzene	200 (J)	LD	13	0.29 (J)	--	--
Xylene	940	LD	47	1 (J)	--	--
Total VOCs	4700	11.8	342.2	20.69	--	--
OVA Readings (ppm)	GT 1000	900	--	850	320	400

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. -- indicates sample collected, but not submitted for laboratory analyses.
4. Sample number SS-135 was analyzed outside the 14 day holding time. Actual holding time was 16 days.

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TABLE 37

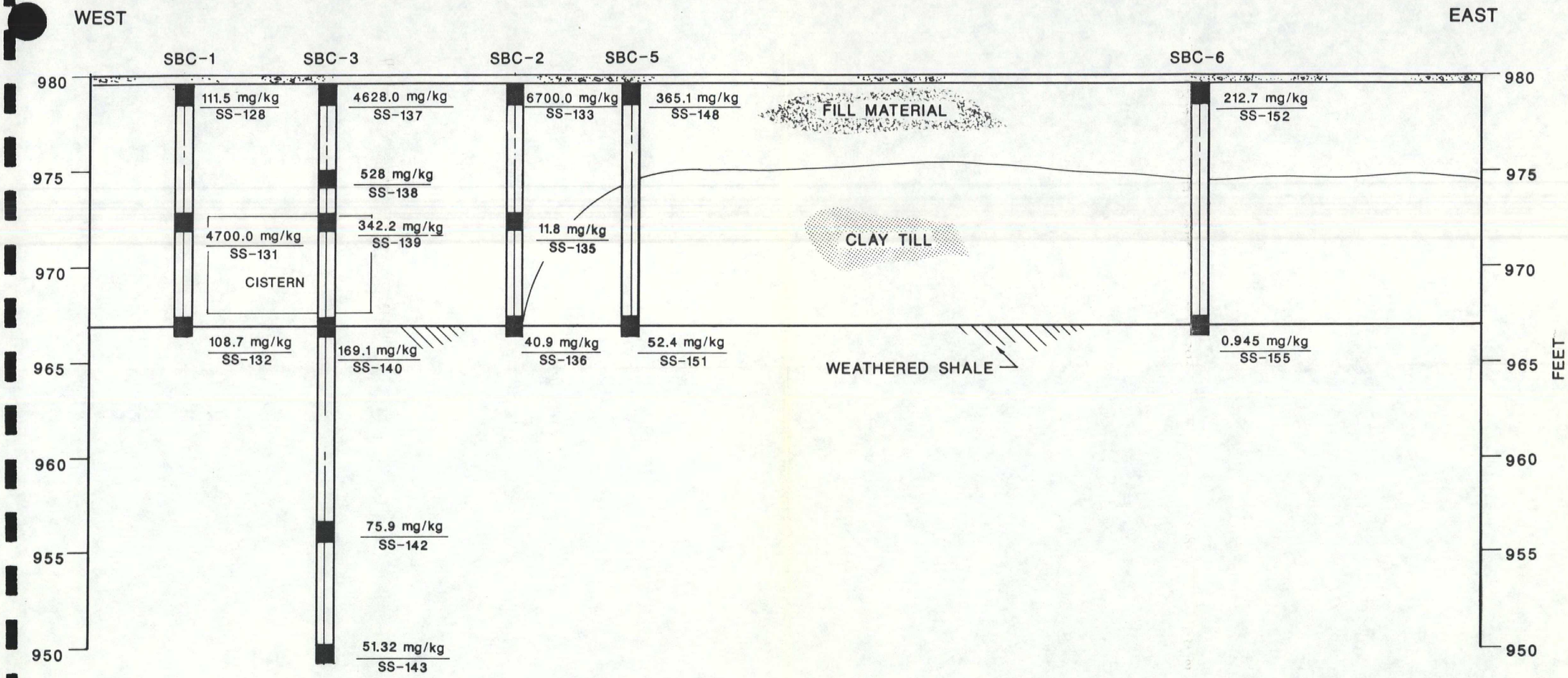
CISTERN BORINGS
ORGANIC ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4	SBC-5	SBC-6	SBC-6
Sample Number	SS-132	SS-136	SS-140	SS-147	SS-151	SS-155	SS-155 RA
Sample Depth (ft)	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
Parameter (mg/kg)							
Methylene Chloride	6.8	1.7	8.5	1.8	4.3	0.21	0.21
Acetone	16	7.8	32	3.2	12	0.14	0.11
2-Butanone	16	6.6	49	5.4	15	0.006(J)	LD
1,1,1 Trichloroethane	LD	LD	LD	LD	LD	0.043	0.037
4-Methyl-2 Pentanone	7.9	LD	11	3.2	2.8	LD	LD
Tetrachloroethylene	LD	LD	4.8	0.88	LD	0.041	0.042
Toluene	29	9.1	24	11.0	7.5	0.180	0.160
Chlorobenzene	LD	LD	LD	LD	LD	LD	LD
Ethyl Benzene	6	2.7	7.8	5.2	2.1	0.037	0.035
Xylene	27	13	32	23	8.7	0.180	0.190
Trans-1,2 Dichloroethylene	LD	LD	LD	LD	LD	0.008	LD
Trichloroethylene	LD	LD	LD	LD	LD	0.010	0.010 (J)
1,1,2-Trichloro -1,2,2-Trifluoroethane	LD	LD	LD	LD	LD	0.090 (J)	0.060 (J)
Trimethylsilanol	LD	LD	LD	LD	LD	LD	0.030 (J)
Total VOCs	108.7	40.9	169.1	53.68	52.4	0.945	0.884
OVA Readings (ppm)	GT 1000	GT 1000	--	GT 1000	340	140	--

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Sample number SS-136 was analyzed outside the 14 day holding time. Actual holding time was 16 days.
4. The surrogate recoveries for sample number SS-155 were outside the QC limits due to matrix effects. Refer to the "Soil Surrogate Percent Recovery Summary" in Appendix C. Sample was reanalyzed SS-155RA.

FIGURE 15



CISTERN BORINGS
VOC CONCENTRATIONS

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